# SITE CLEANUP AND INVESTIGATION REPORT
# ANNETTE ISLAND FAA STATION
# ANNETTE ISLAND, ALASKA

## VOLUME 1
## EXPANDED SITE INVESTIGATION/
## INTERIM CLEANUP

Contract No. DTFA04-90-C-20014
Task Order No. 31

May 1995

Prepared for:

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Alaskan Region
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# EXECUTIVE SUMMARY

Pursuant to Task Order No. 31 of Contract No. DTFA 04-90-C-20014, issued by the United States Department of Transportation (DOT); Federal Aviation Administration, Alaskan Region (FAA); Ecology and Environment, Inc. (E & E) implemented an expanded site investigation and interim cleanup (ESI/IC) plan at the Annette Island FAA Station, Annette Island, Alaska. This Site Cleanup and Investigation Report (SCIR) details E & E's implementation of the ESI/IC and the results of these activities.

The objective of this ESI/IC is to further identify and control immediate releases, as regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Clean Water Act (CWA), and petroleum and hazardous substances, as regulated by the Alaska Department of Environmental Conservation's (ADEC) Hazardous Substance Act.

ESI/IC activities were performed at the Very High Frequency Omnidirectional Range Tactical Air Navigation/Directional Finder (VORTAC/DF), Nondirectional Beacon (NDB)/ H-marker, Remote Center Air/Ground Communications (RCAG), Hangar, Approach Lighting System (ALS), Glide Slope (GS), and Localizer (LOC) facilities. The VORTAC/DF, NDB/H-marker, and RCAG facilities are on land leased by the FAA from the Metlakatla Indian Council. The other facilities are on land formerly leased by FAA.

Annette Island is located entirely within the Annette Island Indian Reservation. The Indian village community of Metlakatla is located approximately 5 miles north of the FAA station. Approximately 1,000 people reside on Annette Island.

## EXPANDED SITE INVESTIGATION CONCLUSIONS AND RECOMMENDATIONS

### VORTAC/DF

Lead, a CERCLA-regulated contaminant, was detected at concentrations exceeding media-specific evaluation criteria (MSEC) and toxicity and characteristic leaching procedure (TCLP) regulatory criteria at the VORTAC/DF facility. Approximately 300 cubic yards of soil at this facility are potentially contaminated. Further action is recommended to address this issue.

### NDB/H-MARKER

Lead, a CERCLA-regulated contaminant, was detected at concentrations exceeding MSEC and TCLP regulatory criteria at the NDB/H-marker facility. Approximately 150 cubic yards of soil at this facility are potentially affected. Further action is recommended to address this issue. Additionally, since access to this facility is unrestricted, steps should be taken to contain the contaminated soil and control access to it.

### RCAG

No CERCLA-regulated contaminants were detected at concentrations that exceeded MSEC or TCLP regulatory criteria at the RCAG facility. No further investigation at this facility is recommended.

## INTERIM CLEANUP ACTIVITIES AND RECOMMENDATIONS

The following IC activities were completed at the Annette Island FAA Station for the RCAG, Hangar, ALS, GS, and LOC facilities.

### RCAG

The inactive, gasoline underground storage tank (UST) at the RCAG was inspected, found to be empty, and locked. Further action is required to decommission this UST according to ADEC regulations.

### Hangar

A small area of the Hangar floor, which was the former location of polychlorinated biphenyl (PCB)-containing transformers was swept clean of lead-containing debris and paint chips and cleaned several times with solvent. The floor sweepings and cleaning solvents and

materials were containerized and disposed according to appropriate regulations. According to PCB wipe sampling, the floor cleaning was unsuccessful in removing PCB contamination; therefore, further cleaning or the removal of the floor is recommended to remediate the area to Toxic Substance Control Act (TSCA) regulatory standards.

**ALS**

Eight oil-filled transformers were sampled for PCBs in the short approach lighting system/runway end identification lights (SALSR) building, which was discovered during on-site activities. Based on this sampling, further action is recommended to dispose of one PCB-containing transformer and various non-PCB oil-filled and dry electrical equipment according to TSCA and FAA good housekeeping practices. The ALS is inactive.

**GS**

Approximately 15 gallons of non-PCB oil was pumped from a transformer into a drum and disposed according to appropriate regulations. Further action is recommended to dispose of the empty transformer according to FAA good housekeeping practices. The GS is inactive.

**LOC**

Five small, sealed transformers, which were discovered at the LOC during field activities, were drummed and stored in the hazardous materials building located at the VORTAC/DF. No further action is required for this facility. The LOC is inactive.

**Table ES-1**

**SITE CLEANUP AND INVESTIGATION ACTIVITIES MATRIX
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA**

| Facility/Site | ESI CERCLA | | ESI POL | | IC | |
|---|---|---|---|---|---|---|
| | Further Action | No Further Action | Further Action | Tank Decommis-sioning | Removal | No Further Action |
| VORTAC/DF | X | | | | | |
| NDB/H-Marker | X | | | | | |
| RCAG | | X | | X | | |
| Hangar | | | | | X | |
| ALS | | | | | X | |
| GS | | | | | X | |
| LOC | | | | | | X |

Key:

ALS = Airport lighting system.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
ESI = Expanded Site Investigation.
FAA = Federal Aviation Administration, Alaskan Region,
GS = Glide slope.
IC = Interim Cleanup.
LOC = Localizer.
NDB = Nondirectional beacon.
POL = Petroleum, oils, and lubricants.
VORTAC/DF = Very high frequency omnidirectional range tactical air/ground communications/directional finder.

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## ACRONYM LIST

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| ADNR | Alaska Department of Natural Resources |
| ANLCSA | Alaska Native Land Claims Settlement Act |
| BGS | Below Ground Surface |
| BNA | Base, Neutral/Acid Extractable |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylenes |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CERCLIS | Comprehensive Environmental Response, Compensation, and Liability Information System |
| DOT | Department of Transportation |
| DRO | Diesel-Range Organics |
| ECI | Environmental Compliance Investigation |
| ECIR | Environmental Compliance Investigation Report |
| ESI/IC | Expanded Site Investigation/Interim Cleanup |
| FAA | Federal Aviation Administration |
| FECP | Facilities Environmental Compliance Program |
| FSS | Flight Service Station |
| HRS | Hazard Ranking System |
| MCP | Master Compliance Plan |
| MSEC | Media-Specific Evaluation Criteria |
| PCB | Polychlorinated Biphenyl |
| POL | Petroleum, Oil, and Lubricant |
| QA | Quality Assurance |
| QC | Quality Control |
| RCRA | Resource Conservation and Recovery Act |
| SCIR | Site Cleanup and Investigation Report |
| TCLP | Toxicity characteristic leaching procedure |
| TSCA | Toxic Substances Control Act |
| TRPH | Total Recoverable Petroleum Hydrocarbons |
| UHF | Ultra High Frequency |
| USFWS | United States Fish and Wildlife Service |
| VHF | Very High Frequency |
| VOC | Volatile Organic Compounds |
| VOR | Very High Frequency, Omnidirectional-Range |
| VORTAC | Very High Frequency, Omnidirectional-Range, Tactical Air Navigation |
| VPH | Volatile Petroleum Hydrocarbon |
| VPH-G | Volatile Petroleum Hydrocarbon as Gasoline |
| VPH-D | Volatile Petroleum Hydrocarbon as Diesel |
| XRF | X-ray fluorescence |

# 1. INTRODUCTION

## 1.1 PURPOSE

Pursuant to Task Order No. 27 of Contract No. DTFA 04-90-C-20014, issued by the United States Department of Transportation (DOT), Federal Aviation Administration, Alaskan Region (FAA), Ecology and Environment, Inc., (E & E) implemented an expanded site investigation and interim cleanup (ESI/IC) plan at the Annette Island FAA Station, Annette Island, Alaska. This Site Cleanup and Investigation Report (SCIR) details E & E's implementation of the ESI/IC and the results of these activities.

The objective of this ESI/IC is to further identify and control immediate releases, as regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Clean Water Act (CWA), and petroleum and hazardous substances, as regulated by the Alaska Department of Environmental Conservation's (ADEC) Hazardous Substance Act. The systematic ESI/IC activities reported in this SCIR conform with procedures established in FAA's 1992 Facilities Environmental Compliance Program (FECP), Master Compliance Plan (MCP). CERCLA Section 120 requires that preliminary assessments and site investigations be conducted by each federal agency that has facilities and sites on which hazardous substances have been used and potentially removed for disposal.

FAA, under its FECP, conducted an environmental compliance investigation (ECI) of Annette Island FAA Station in 1991 for potential hazardous materials contamination. The results were reported in the *Environmental Compliance Investigation Report (ECIR) for Annette Island FAA Station* (E & E 1992b). The ECIR recommended additional ESIs at two selected Annette Island facilities and sites and IC of identified hazardous wastes. These recommendations and a draft ESI/IC work plan were submitted to the United States Environmental Protection Agency (EPA) and ADEC for review and comment.

EPA and ADEC review comments were incorporated into the final ESI/IC work plan (E & E 1993b). The work plan constituted the primary scope of work for this field investigation, which was conducted from June 10 to June 22, 1994.

ESIs were conducted on three Annette Island facilities/sites: Very High Frequency Omnidirectional Range Tactical Air Navigational/Directional Finder (VORTAC/DF), Nondirectional Beacon (NDB)/H-marker, and Remote Center Air/Ground Communications (RCAG), where the ECIR indicated CERCLA-related hazardous material usage or disposal. The CERCLA results from the ECIR were used to focus on source, target, and pathway sampling as defined by EPA's Hazard Ranking System (HRS). EPA Level IV analysis was used to characterize these areas for HRS scoring purposes. Additional background, pathway, and target data were collected where warranted. The facility sampling activities and data results are discussed individually for each facility or site. These discussions are designed to fulfill FAA's responsibilities to provide detailed site information pursuant to Section 120(d) of CERCLA 42 V.S.C. 9620(d). Because the ECIR addresses spills, petroleum, and hazardous materials, release investigations were also conducted to address the requirements of Article 3 of Title 18, Alaska Administrative Code, Chapter 75 (18 AAC 75), State of Alaska Oil and Hazardous Substances Pollution Control Regulations, as implemented by ADEC.

Wetland surveys were conducted at each facility in conjunction with the ESI. The primary objective of the wetland surveys were to identify wetlands within 0.2 mile downgradient of any potential CERCLA source of contamination. These wetland surveys conform to the EPA definition of wetlands in 40 Code of Federal Regulations (CFR), Part 230, Subpart E, Section 230.41, which identify three factors (vegetation, soils, and hydrology) that must be considered to determine the presence of a wetland. Consistent with this definition, dominant plant species in each major vegetation stratum (tree, sapling/shrub, herbaceous) within the study area were identified and listed. Each plant's wetland indicator status (e.g., obligate, facultative wet, facultative, facultative upland, obligate upland) was then assigned using the United States Fish and Wildlife Service's (USFWS's) *National List of Plant Species that Occur in Wetlands: Alaska (Region A)* to determine the presence of hydrophytic vegetation (Reed 1988). Soils are evaluated by determining the soil type, examining soil horizonation and color, and determining the height to which and the length of time soils are saturated. The hydrology criteria are met when an area is periodically inundated or has soil saturated at or near the surface at some time during the growing season sufficient to support

hydrophytic vegetation. When water levels drop, visual indications typically remain, thereby allowing assessment of hydrology, as indicated by water marks and drainage patterns.

The IC portion of this task order was a definitive action taken by FAA to remove any immediately identified CERCLA, Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), or petroleum hazardous substances from the station, pursuant to appropriate regulations. An IC was conducted at the RCAG, Hangar, Approach Lighting System (ALS), Glide Slope (GS), and Localizer (LOC) facilities and included cleaning polychlorinated biphenyl (PCB)-containing oil from a concrete floor, removal of electrical equipment, and sampling transformer oil for PCBs.

## 1.2 STATION OVERVIEW

The Annette Island FAA Station is an air navigation station whose property currently is leased to the FAA by the Metlakatla Indian Council. The Annette Island FAA Station is located near the abandoned Annette Airport on Annette Island, 5 miles south of the town of Metlakatla (population approximately 1,000) (see Figures 1-1 and 1-2). Annette Island is surrounded by saltwater and is situated near Dixon Entrance and the Canadian border, 15 miles south of Ketchikan, Alaska. Facilities at the station lie within 0.5 mile of both Clarence Strait to the west and Tamgass Harbor to the east. The latitude and longitude for the airport are 55°02'34"N and 131°34'14"W. The United States Public Land Survey coordinates are Township 79S, Range 92E, Sections 4, 5, 8, and 9 Copper River Meridian.

FAA has operated the Annette Island FAA Station since the construction of air navigational facilities in 1948. The Annette Island FAA Station is not continuously manned, but the station is visited regularly by FAA personnel based in Ketchikan. The Annette Island FAA Station was deactivated in 1973 prior to FAA's transfer of its property title to the Metlakatla Indian Council. Since then, several facilities and properties have been reactivated and added to or subtracted from the total station area. FAA owns buildings associated with the air navigation and communication facilities, which are on leased property. The currently leased station facilities investigated under this ESI effort consist of the VORTAC/DF, NDB/H-marker, and RCAG.

## 1.3 ENVIRONMENTAL SETTING

This section describes the Annette Island FAA Station environmental setting. It includes detailed discussions of the station geology, groundwater, surface water, climate, and a description of sensitive environments in the station area.

### 1.3.1 Climate

The Metlakatla Peninsula lies in the maritime climate zone of southeastern Alaska with warm winters, cool summers, and relatively heavy precipitation. Average summer temperatures range from 36° Fahrenheit (F) to 52°F. Frequent storms contribute to the high average annual precipitation of 115 inches. In addition to the rain, cloud cover is present 62% of the time, resulting in poor visibility. Average winter temperatures range from 28°F to 42°F. Annual snowfall averages 51 inches (Alaska Department of Community and Regional Affairs [ADCRA] 1984).

Annette Island wind data, collected over a 29-year period, indicates an average wind speed of 10 miles per hour with winds primarily from the southeast. Metlakatla, however, is generally protected from southeasterly winds due to its location on the lee side of the island (ADCRA 1984).

### 1.3.2 Vegetation and Wildlife

Wetlands dominate the landscape on the Metlakatla Peninsula. Vegetation on the peninsula primarily is composed of sedges, sphagnum moss (*Sphagnum spp.*), crowberry (*Empetrum nigrum*), Labrador tea (*Ledumdewmbens*), bog rosemary, bog laurel (*Kalmia microphylla*), isolated strands of western hemlock (*Tsuga heterophylla*), Alaska yellow cedar (*Chamaecyparis motilatensis*), and shore pine (*Pinus cintorta*) (ADCRA 1984).

The dominant wetlands present on the Metlakatla Peninsula include: open water, shore pine-yellow cedar muskeg, and forested. The open water and shore pine-yellow cedar wetlands constitute a wetland complex that covers thousands of acres on the level and rolling hills areas of the peninsula. The forested wetlands are found in isolated inland areas and along the coast line. Wetlands at the FAA facilities consist primarily of the open water/shore pine-yellow cedar wetland complex.

Soils and wetlands in the vicinity of the FAA facilities have some common characteristics. The soil on Annette Island is classified as SO18 by the Exploratory Soil Survey of Alaska (United States Department of Agriculture [USDA 1979]). The applicable soils within

this soil classification includes Typic Sphagnofibrists and Fluvaquentic Cryofibrists. These both consist of poorly drained organic soils that occur in nearly level or rolling areas or in marshes in valley bottoms. According to field observations and the USFWS National Wetlands Inventory map of the area, a scrub-shrub wetland complex, containing both isolated upland islands and open water wetlands, covers several thousand acres of Annette Island in the vicinity of the FAA facilities. The American Peregrine falcon is a federally listed endangered species that nests in southeastern Alaska. They breed primarily in the outer islands and along the coast, but none have been identified on Annette Island. Other regional endangered species include the humpback, fin, and gray whales, which may pass through neighboring waters as they migrate from summer feeding areas to winter breeding areas.

The shoreline of the island, particularly in areas protected from wave action, is bordered by strand vegetation that consists of Lyngbye's sedge, sand spurry, tufted hairgrass, beach ryegrass, and Pacific silverweed. Nearshore vegetation includes several species of kelp, large brown algae, red coralline algae, and eelgrass.

The Misty Fjords National Monument Wilderness lies on the mainland approximately 10 miles east of Annette Island, across Revillagigedo Channel. The wilderness area does not border Annette Island.

Fishing and lumbering industries support the Metlakatla town economy. A sizable fishing fleet exists in this area, and the only fish traps allowed in Alaska are used in this area. According to the 1989 preliminary Alaska commercial fisheries harvest values, the commercial harvest for the state of Alaska in the southeastern region was: total salmon, 257,870 pounds (Annette Island trap salmon, 500.26 pounds; gill net salmon, 9,930.60 pounds) total herring harvest (in areas other than Seymour Canal, Sitka Sound, and Kah Shakes), 3,400 pounds; total shellfish harvest, 9,929 pounds; total groundfish landed for all gears, 9,162.5 pounds (ADCRA 1984).

### 1.3.3 Regional Geology

Annette Island is part of the northern region of an extensive coastal mountain range called the Cordilleran Range. The range and its associated Alaskan offshore islands extend along the western edge of North America from Southern California to the Alaskan Peninsula. Annette Island lies in the Wrangell-Revillagigedo belt of metamorphic rocks.

During the Pleistocene Epoch, the Metlakatla area was presumably covered by ice several times. Glaciers smoothed the present Metlakatla Peninsula and deeply eroded the

valleys on the rest of Annette Island. The last major glaciation ended more than 10,000 years ago.

The Annette Island FAA Station is situated on the southwestern portion of Annette Island in an area referred to as the Metlakatla Peninsula (see Figure 1-1). This area is relatively flat compared to the mountainous northern part of the island. The maximum elevation on the peninsula is Yellow Hill at 540 feet above mean sea level (AMSL), compared to mountains of over 2,000 feet AMSL in the northern part of the island. The airport area elevation is less than 100 feet AMSL. The Metlakatla Peninsula comprises approximately 18 square miles.

Bedrock underlying the Metlakatla Peninsula is chiefly composed of schist, gneiss, and hornfels. These rocks are locally mixed and in part gradational with foliated granitic rocks, which in turn grade into foliated quartz diorite and diorite. Strike and dip of beds are generally variable, and minor offsets are common. Bedrock is of late Paleozoic to early Mesozoic age. Six types of surficial geologic materials of Quaternary age are present: firm diamicton, emerged shore, modern shore and delta, alluvial deposits, very soft muskeg and other organic deposits, and firm to soft artificial fill (United States Geological Survey [USGS 1971]).

Surface lithology found on the island include organic muck, glacial till, and raised beach deposits. The general lithology and stratigraphy of the raised beach deposits change laterally over short distances. The deposits are generally 5 to 10 feet in thickness. At a location on the northern edge of the Annette Island FAA Station, the deposits consist of 4 to 6 feet of sandy gravel overlying silty and clayey bluish-gray sand of unknown thickness. The gravel is poorly sorted (USGS 1971).

Surface soil consists of poorly drained sandy gravel intermixed with marine clay and decomposed organic matter. The depth of the sandy gravel typically ranges from 4 to 6 feet, with a maximum thickness of 30 feet (ADCRA 1984; USGS 1971). Normal ranges of elemental concentrations in Alaskan soils are presented in Table 1-1.

### 1.3.4 Regional Hydrology

Although annual precipitation at the Annette Island FAA Station is 115 inches, the igneous and metamorphic rocks underlying most of the region generally yield only small amounts of water. The overlying muck, when present, is relatively impermeable and does not allow for recharge of the underlying bedrock. Interbedded gravel, sand, silt, and clay

interpreted as raised beach deposits may be sources of groundwater. The number, spacing, attitude, size, and interconnection of fractures in bedrock determine the availability and movement of groundwater. Highly fractured ultrabasic rocks located south of Yellow Hill (north of the Annette Island FAA Station) provide openings for seeps and small springs. Other small springs, which typically are dry in the summer, issue from fractured rocks along the west side of the peninsula. The Metlakatla Peninsula is a swampy, heavily vegetated low-land generally less than 200 feet AMSL (USGS 1971). A test hole drilled at the northern end of the Annette Island FAA Station produced water at 0.5 gallons per minute (gpm) for 8 hours from 70 to 90 feet below ground surface (BGS) and 37 gpm for 23 hours from 332 to 336 feet BGS (USGS 1971). Groundwater is not currently used as a drinking water source on the island.

Chester Lake is Metlakatla's community water source. The lake is approximately 3.5 miles northeast of the Annette Island FAA Station (see Figure 1-2). Water is transferred to a treatment plant for addition of chloride and fluoride and then flows via underground pipes to approximately 400 connections in the town. Average per capita consumption is estimated at 250 gallons per day (gpd) with peak use in the community reaching an estimated 0.8 million to 1.5 million gpd. The system capacity is 1.5 million gpd (ADCRA 1984).

### 1.3.5 Cultural Resources

A request was made of the State of Alaska, Department of Natural Resources (ADNR), to determine whether prehistoric or historic cultural resources exist at any of the FAA stations under investigation. Based on the Alaska Heritage Resources Survey, no cultural resources have been identified at the Annette Island FAA Station (ADNR 1991).

## 1.4 PROJECT HISTORY

### 1.4.1 FAA 1988 Site Investigation

In 1988, FAA performed a site investigation at Annette Island to inspect the station for hazardous materials (Eberhardt 1988). The investigation's findings were not relative to the FAA-leased or formerly leased facilities included in this report.

### 1.4.2 United States Army Corps of Engineers (USACE) Site Investigation

In September 1985, the United States Department of Defense performed an inventory of materials and debris remaining at the landing field (USACE 1990). Electrical equipment

stored in Room A of then Hangar facility was sampled for PCBs. Results are included in the Annette Island ECIR (E & E 1992b).

### 1.4.3 FAA 1990 Underground Storage Tank Study

An underground storage tank (UST) investigation was performed by FAA in 1990 at the Annette Island FAA Station (Harding Lawson Associates [HLA] 1990). Three USTs were identified during that investigation. Two USTs were located at the VORTAC/DF facility, and one UST was located at the RCAG facility. One UST at the VORTAC/DF subsequently was removed, and the fuel in the remaining UST was changed from gasoline to diesel. These three tanks were present at the time of the ECI. In addition, the previous investigation indicated that a 515-gallon gasoline UST located at the NDB/H-marker facility had been removed in 1981.

### 1.4.4 FAA 1991 Environmental Compliance Investigation

In August 1991, E & E conducted an ECI for the Annette Island FAA Station. ECI activities included conducting literature searches, real estate searches, site reconnaissance, site inventory of toxic and hazardous materials, site sampling, sample analysis and production of an ECIR which presented conclusions and recommendations for each facility and presented information for EPA's HRS.

### 1.4.5 FAA 1992 Removal Project

Hazardous and nonhazardous wastes were removed from the Annette Island FAA Station under Task Order No. 13. A preliminary station visit, performed to inventory and inspect the wastes to be disposed of, was conducted on September 10 and 11, 1992. The removal action was conducted on October 15 to 17, 1992. All wastes designated for disposal were packaged for shipment and were released to the initial off-site transporter. Waste packaging efforts included securing large transformers within steel or plastic totes, bulking residual drum liquids into a new drum, and labpacking smaller waste items into drums. Stained soil found contaminated with PCB oil from rectifiers behind the former FAA warehouse building (now Metlakatla Power and Light [MPL] offices) was excavated and removed for disposal. Laboratory samples were collected from this excavation site, and wipe samples were collected at the old FAA hanger building from stained patches of concrete that had resulted from transformer oil leakage. Laboratory results later indicated that the soil

excavation had been conducted successfully, but residual PCB contamination was still present in the concrete stains.

## 1.5 SITE CLEANUP AND INVESTIGATION REPORT ORGANIZATION

This SCIR is organized to provide the reviewer with the relevant ESI and IC activities on a facility-by-facility basis. For convenience, the SCIR is divided into three volumes to allow review and research of a particular element while concentrating on a particular FAA facility or site.

Volume 1 is structured with major chapters defining:

- Purpose and organization
- General site investigation and cleanup activities
- Detailed ESI and IC activities discussed on a facility-by-facility basis and
- Overall station conclusions and recommendations.

Volume 2 supports Volume 1 with:

- Photolog
- Laboratory data validation memoranda
- Laboratory data sheets and
- Chain-of-custody reports.
- Waste categorization and disposal documentation, including:
  - Inventory of waste removed
  - Waste transporters and Treatment, Storage, and Disposal (TSD) facilities and
  - Waste shipping papers.

Volume 3 supports Volume 1 with:

- X-ray fluorescence (XRF) field screening raw data.

## Table 1-1

## NORMAL RANGES OF ELEMENTAL CONCENTRATIONS IN SOILS
**(All measurements are in ppm [mg/kg].)**

| Element | Crustal Average[a] | Alaska Mean[b] | Western U.S. Mean[c] | Western U.S. Normal Range Mean ±1 s.d.[b] | Normal Alaskan Range[d] |
|---|---|---|---|---|---|
| Aluminum | 71,000 | 62,000 | 58,000 | 29,000-116,000 | 12,000-120,000 |
| Antimony | 0.2 | — | 0.47 | 0.22-1.01 | — |
| Arsenic | 1.8 | 6.7 | 5.5 | 2.8-10.9 | <10-750 |
| Barium | 424 | 595 | 580 | 337-998 | 39-3,100 |
| Beryllium | 2.8 | 1.5 | 0.68 | 0.30-1.56 | <1-7 |
| Cadmium | 0.2 | — | 0.2 | 0.1-0.5 | — |
| Chromium | 100 | 50 | 41 | 19-90 | 5-390 |
| Cobalt | 25 | 13 | 7.1 | 3.6-14.0 | <2-55 |
| Copper | 55 | 24 | 21 | 10-43 | 3-810 |
| Iron | 50,000 | 35,000 | 21,000 | 10,800-41,000 | 5,500-100,000 |
| Lead | 13 | 12 | 17 | 9-31 | <4-310 |
| Manganese | 950 | 510 | 380 | 192-752 | 200-400 |
| Mercury | 0.08 | — | 0.05 | 0.02-0.11 | — |
| Nickel | 75 | 24 | 15 | 7-32 | <3-320 |
| Selenium | 0.05 | — | 0.23 | 0.09-0.56 | — |
| Silver | 0.07 | — | 0.2 | 0.1-0.5 | — |
| Thallium | 0.5 | — | 0.2 | 0.1-0.4 | — |
| Tin | 2 | — | 0.9 | 0.4-1.9 | — |
| Vanadium | — | — | 70 | 36-136 | — |
| Zinc | 70 | 70 | 55 | 31-98 | <20-2,700 |
| Molybdenum | 1.5 | 0.86 | 0.85 | 0.39-1.85 | <2-15 |
| Thorium | 7.2 | — | 9.1 | 6.1-13.6 | <1.6-76 |
| Uranium | 1.8 | 2.3 | 2.5 | 1.7-3.6 | <0.2-4.5 |
| Yttrium | 33 | 14 | 22 | 13-37 | <4-100 |



Key at end of table.

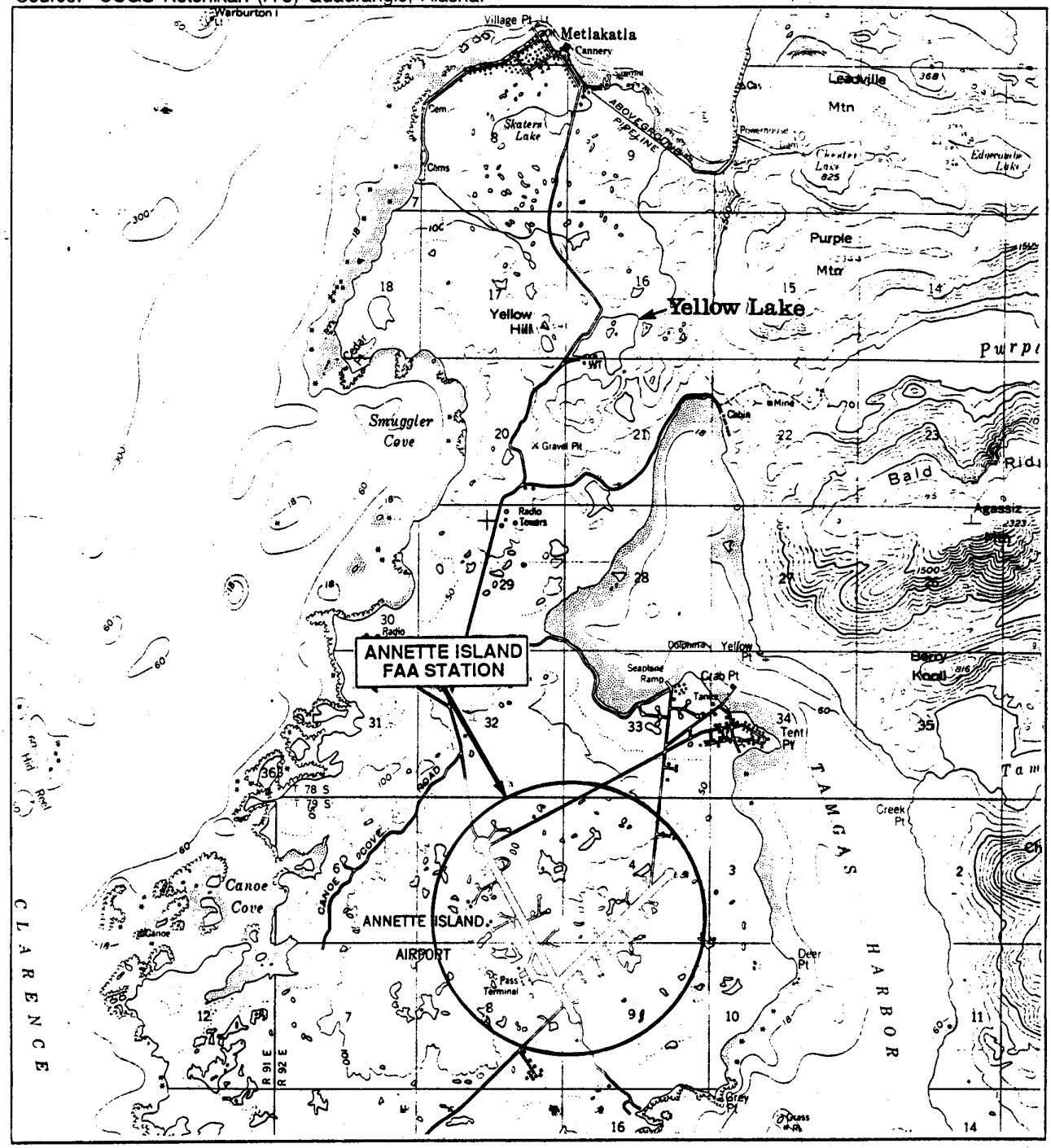
[a] Various published sources.
[b] Alaska Soil Data From: Gough, L.P., Severson, R.C., Shacklette, H.T. 1988. Element Concentrations in Soils and Other Surficial Materials of Alaska. U.S. Geological Survey Professional Paper 1458.
[c] Western Soil Data From: Shacklette, H.T., and Boerngen, J.G.; 1984: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270.
[d] Means and standard deviations are Geometric to account for log-normal distributions.

Key:

— = Data not provided.
mg/kg = Milligrams per kilogram.
ppm = Parts per million.

Source: Ecology and Environment, Inc. 1994.

Source: USGS Ketchikan (A-5) Quadrangle, Alaska.




STATION LOCATION

SCALE
0.5 0 0.5 1 Mile

| Ecology and Environment, Inc. | |
|---|---|
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| Title: Annette Island FAA Station Location | |

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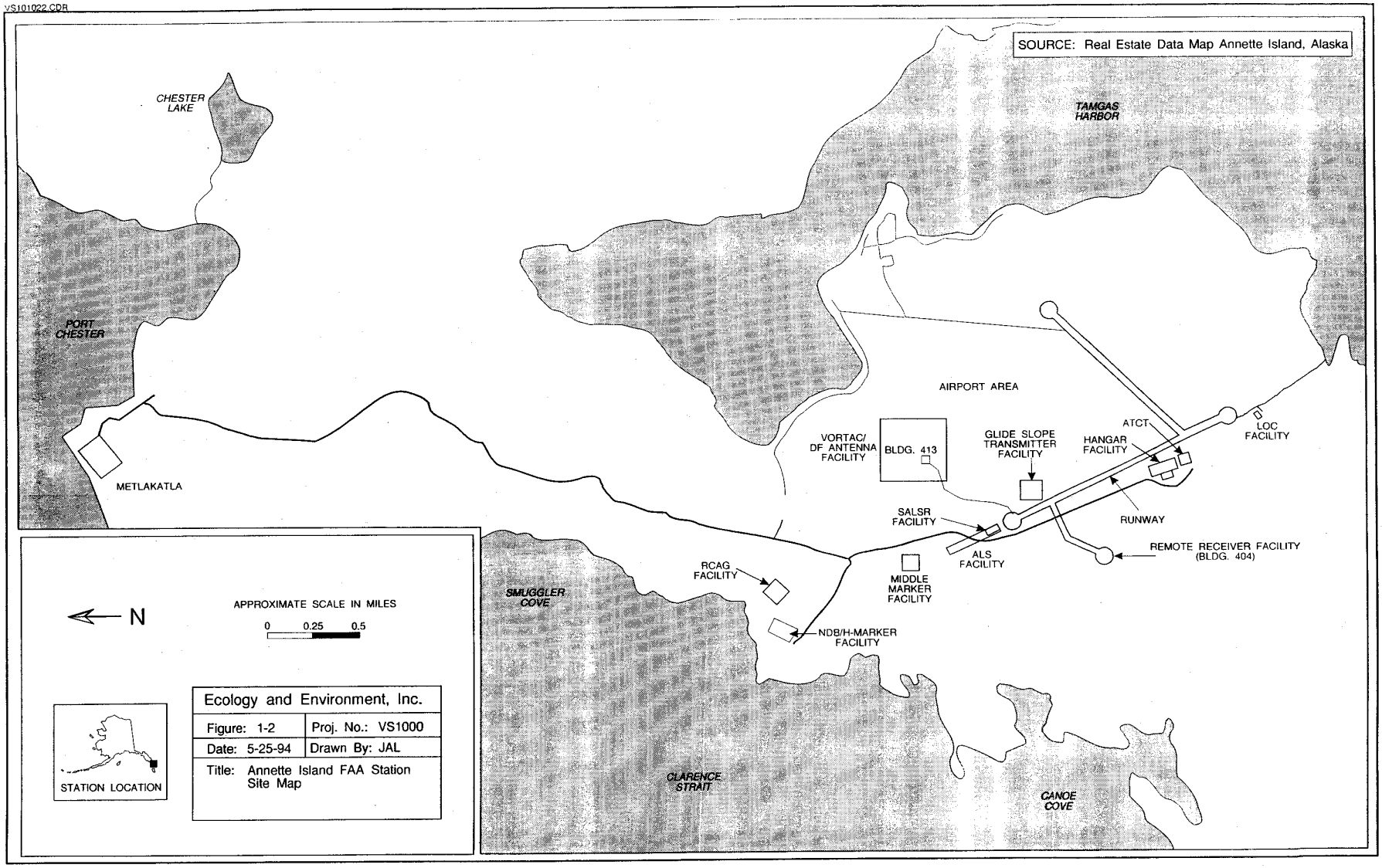

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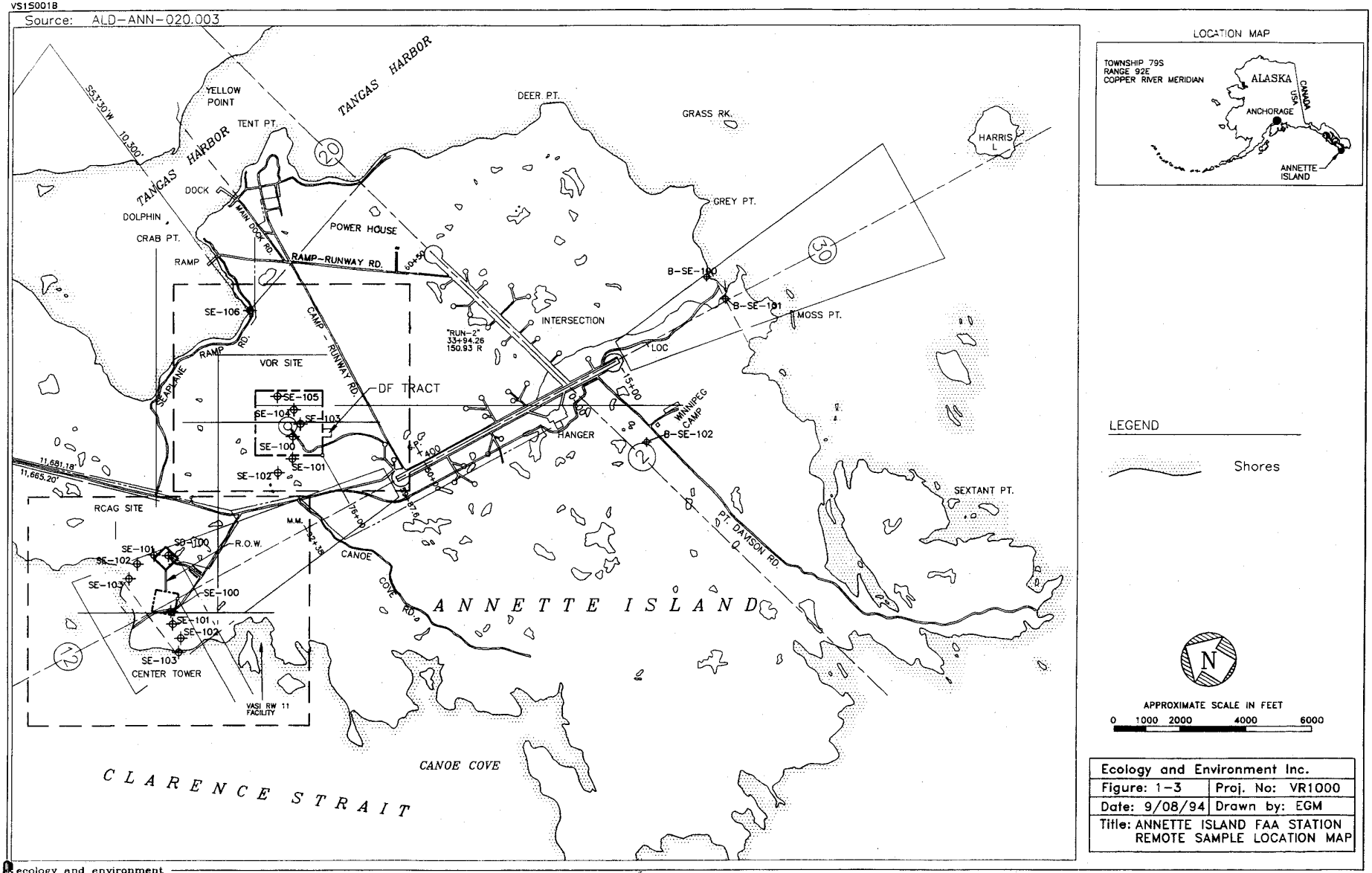


LOCATION MAP




LEGEND

Shores

N

APPROXIMATE SCALE IN FEET

0 1000 2000 4000 6000

| Ecology and Environment Inc. | |
|---|---|
| Figure: 1-3 | Proj. No: VR1000 |
| Date: 9/08/94 | Drawn by: EGM |
| Title: ANNETTE ISLAND FAA STATION REMOTE SAMPLE LOCATION MAP | |

ecology and environment

# 2. EXPANDED SITE INVESTIGATION AND INTERIM CLEANUP ACTIVITIES

The site investigation and cleanup activity at the Annette Island FAA Station consisted of ESIs at the following facilities:

- VORTAC/DF
- NDB/H-marker and
- RCAG.

IC activities were conducted at the following facilities:

- RCAG
- Hangar
- ALS
- GS and
- LOC.

This section describes first the ESI and then the IC activities conducted at the site. The third part of this section discusses the development of site-specific risk-based evaluation criteria. An in-depth discussion of individual facility investigations and cleanup activities is presented in Sections 3 through 9.

## 2.1 EXPANDED SITE INVESTIGATION

### 2.1.1 General

The ESI was performed at the Annette Island FAA Station from June 10 to 22, 1994. The investigation consisted of the collection of potential source and target characterization

samples at potential CERCLA contaminant source areas in the VORTAC/DF, NDB/H-marker, and RCAG facilities; wetlands survey associated with CERCLA source areas; and collection of samples at potential ADEC-contaminated source areas at the VORTAC/DF facility. The field team that performed the ESI and their affiliations and assignments are listed in Table 2-1.

### 2.1.2 Expanded Site Investigation Activities

#### 2.1.2.1 VORTAC/DF Facility

Activities at the VORTAC/DF facility included the collection of sediment, surface and subsurface soil samples. Surface and subsurface soil samples were collected to delineate lead contamination potentially associated with leaded paint overspraying operations and to delineate petroleum contamination associated with the UST. Surface sediment and soil samples were collected along overland surface water routes and in adjoining wetlands for target characterization. Details of the ESI conducted at the VORTAC/DF facility are provided in Section 3.2

#### 2.1.2.2 NDB/H-MARKER Facility

Sampling at the NDB/H-marker facility included the collection of sediment, surface, and subsurface soil samples. Surface and subsurface soil samples were collected to delineate the areal and vertical extent of CERCLA contamination associated with ash deposited in the soil around the former NDB/H-marker building foundation, resulting from when the building was burned down. Surface sediments and soil samples were collected along overland surface water pathways and in adjoining wetlands for target characterization. Details of the ESI at the NDB/H-Marker facility are provided in Section 4.2.

#### 2.1.2.3 RCAG Facility

Sampling at the RCAG facility included the collection of surface soil samples to delineate the areal extent of potential CERCLA contamination associated with drums formerly stored in the area. Sediment samples were also collected along overland surface water pathways and in adjoining wetlands for HRS target characterization. Details of the ESI at the RCAG facility are provided in Section 5.2.

### 2.1.3 Deviations from the Work Plan

Deviations from the ESI work plan are described on a facility-specific basis in Sections 3.2.1.4, 4.2.1.4, and 5.2.1.3. All deviations were undertaken with the concurrence of FAA and were based on sound technical considerations.

## 2.2 INTERIM CLEANUP

### 2.2.1 General

IC activities were performed at the RCAG, Hangar, ALS, GS, and LOC facilities. Work was conducted between June 13 and June 17, 1994. The field team for the IC activities consisted of two E & E personnel and one subcontractor personnel. The personnel and their affiliations and roles are listed in Table 2-1.

### 2.2.2 Interim Cleanup Activities

#### 2.2.2.1 RCAG Facility

IC activities at the RCAG facility were to include pumping out remaining fuel from the inactive gasoline UST. Upon inspection, however, the UST was observed to be empty and was capped and locked. Details of the IC activities at the RCAG facility are provided in Section 5.3.

#### 2.2.2.2 Hangar Facility

IC activities at the Hangar facility included the cleanup and subsequent sampling of a small section of the hangar concrete floor. This section of the hangar was the former location of three FAA-owned, PCB-containing transformers. Debris from the floor was first removed and then the floor cleaned with solvents. PCB wipe samples were then collected from this area. Details of the IC activities at the Hangar facility are presented in Section 6.2.

#### 2.2.2.3 ALS Facility

IC activities at the ALS facility included sampling inactive, oil-filled transformers and electrical equipment for PCB in accordance with TSCA regulations. Details of the IC activities at the ALS are presented in Section 7.2.

#### 2.2.2.4 GS Facility

IC activities at the GS facility included pumping non-PCB transformer oil into a drum and removing the drum from Annette Island. Details of the IC activities at the GS are presented in Section 8.2.

#### 2.2.2.5 LOC Facility

IC activities at the LOC facility included drumming several small, sealed transformers and properly storing the drum at the VORTAC/DF facility. Details of the IC activities at the LOC are presented in Section 9.2.

### 2.2.3 Deviations from the Work Plan

Deviations from the work plan are described on a facility-specific basis in Sections 5.2.1.3, 6.3, 7.3, 8.3, and 9.3. All deviations were undertaken with the concurrence of FAA.

## 2.3 SAMPLE QUALITY ASSURANCE

The Annette Island Station sampling program was designed using sampling strategies to focus on localized areas of surface and subsurface soil, and sediment contamination. Specific sampling locations were selected based on the approved ESI/IC work plan (E & E 1993b) and field observations. Sample points were recorded using a global position system. With the exception of the background samples, samples were collected at points either known or suspected to be the most probable locations of contamination or along migration pathways. When actual sample locations differed from the sample locations defined in the ESI/IC, approval from the FAA Contracting Officer (CO) was obtained.

Level II, III, and IV samples were collected to provide the maximum amount of information with the appropriate level of quality in the most cost-effective manner possible. Level III samples were collected to confirm the presence of contaminants identified by Level II screening analysis. Level II samples were field screening samples. Field screening methods included Spectrace XRF analysis for metals in soils and lead in paint; EnSys Petro RISc analysis for petroleum fuels in soils; and EnSys PCB RISc analysis for PCBs in wipe samples. Sampling and analysis protocol for each of these screening methods is presented in Appendix F.

All samples were collected, packaged, stored, shipped, and analyzed in accordance with EPA and ADEC guidelines and standard operating procedures as defined in the Task No. 11, Generic Work Plan (E & E 1992c) and the Annette Island ESI/IC. Data validation qualifiers are discussed in Section 2.4.1; data usability is described in Section 2.5; Section 2.6 presents the quality assurance (QA)/quality control (QC) results for samples from the Annette Island FAA Station; and field QA information and analytical QA/QC specifics are presented in Appendix F.

## 2.4 DATA VALIDATION

Levels III and IV analytical data were validated following the guidelines referenced in the data validation memoranda presented in Appendix B. The memoranda identify laboratory analytical QA/QC data related to all sample results. Sample analysis procedures specified in the ESI/IC identify the method/matrix-specific QC tests and criteria limits for the results of these tests. In validation, QC and associated sample results underwent QA review to identify analytical results that failed to meet criteria. Data associated with QC tests that failed to meet the criteria were flagged with qualifiers. The data validation memoranda document the sample/analyte-specific causes for all flags. Level II data were validated according to the protocols presented in Appendix F.

### 2.4.1 Data Qualifiers

Data qualifiers are employed for both metal and organic data results. These qualifiers are defined below:

J = The analyte was analyzed for and was positively identified, but the associated numerical value may not be consistent with the amount actually present in the sample. The data should be seriously considered for decision-making and are usable for many purposes.

NJ = The analysis indicated that the analyte has been tentatively identified and that the associated numerical value may not be consistent with the amount actually present in the sample.

R = QC information indicated that data are unusable for any purpose. The analyte was analyzed for, but the presence or absence of the analyte has not been verified.

### 2.4.2 Metals Data

Data validation for metals analyses applies to data for all Level III and Level IV Target Analyte List (TAL) furnace metals, mercury, and inductively coupled argon plasma metals, toxicity characteristic leaching procedure (TCLP) extractable metals, and Level II XRF metals. QC criteria considered for metals analyses include or apply to sample holding times, calibration verification, laboratory-reported detection limits, preparation blank results, inductively coupled argon plasma spectrometry interference check sample results, spike sample results, duplicate sample results, laboratory control sample results, and atomic absorption (AA) post-digestion spike recovery, and duplicate injection results.

### 2.4.3 Organic Data

Data validation for organic analyses applies to data for all Level II, III, and IV: benzene, toluene, ethylbenzene, xylenes (BTEX); base neutral/acid extractables (BNAs); volatile organic compounds (VOCs); chlorinated pesticides/PCB; volatile petroleum hydrocarbons as gasoline (VPH-G); extractable diesel-range petroleum hydrocarbons as diesel-range organics (DROs); total recoverable petroleum hydrocarbons (TRPH); and dioxin. Due to the analytical procedures for organic analyses, data qualifiers are assigned using slightly different criteria when compared to inorganic analyses. These QC criteria include or apply to sample holding times, instrument calibration, laboratory method blank results, surrogate spike recovery results, matrix spike/matrix spike duplicate results, and internal standard performance results.

## 2.5 DATA USABILITY

In addition to data validation of laboratory performance, a data usability review was completed for all Annette Island FAA Station data. The usability review determines the adequacy of data and/or information on a project-/site-/sample-/analyte-specific basis to:

- Describe or characterize sample or site conditions;
- Describe, characterize, or interpret conditions or activities impacting a sample or site; and
- Describe, characterize, or interpret the results of conditions or activities impacting a sample or site.

Data usability is a function of the data quality objectives (DQOs) outlined as ESI/IC objectives and the overall QA review of field, laboratory, and files/reference search data. The qualification of analytical data does not necessarily preclude the use of that data.

The primary goal of sample collection and analysis under the ESI process is to determine the presence or absence of target analytes and, if present, to provide a reasonable estimate of concentration. Data that failed to meet minimum data validation standards were rejected (annotated with an "R" qualifier in the data validation memoranda in Appendix B) and are neither reported nor utilized beyond that point. Data flagged "J" or "NJ", however, were reviewed further to identify specific reasons for flagging, and it was determined that qualified data are usable for the purposes of this report; this information was incorporated into a determination of usability. Qualifiers from the associated data validation memorandum were not included in summary tables or text unless they had an impact on decisions regarding recommendations for further actions at the station.

Such decisions require accurate data; therefore, data whose qualitative and/or quantitative accuracy at action level concentrations is in doubt require the decision-maker to consider the consequences of a determination either to take no further action or to take action. Recommendations for such decisions are presented in facility-specific sections and are summarized in Section 10.

## 2.6 PRESENTATION OF ANALYTICAL RESULTS

Annette Island FAA Station sample collection information are presented in facility sections. This information includes sample number, matrix, location, sampling date, and laboratory analyses for each sample. Low levels of several common laboratory and/or sampling contaminants are normally encountered in environmental laboratory analyses. The most common of these are acetone, methylene chloride, 2-butanone, carbon disulfide, toluene, di-n-butyl phthalate, bis(2-ethylhexyl)phthalate, di-n-octyl phthalate, and butyl benzyl phthalate. The determination whether to include these analytical results in this report was made on a sample-by-sample basis during the QA and data usability review.

Analytes detected in samples at less than five times the levels measured in the corresponding trip and/or rinsate blanks are included in the summary tables but not discussed in the text. All analytical results are included in Appendices B and G. Summary tables of analytes found in samples, including background samples, collected at the Annette Island FAA Station are presented in facility sections.

## 2.7 FIELD QUALITY ASSURANCE SAMPLES

Field QC samples for Levels II, III, and IV were collected by sampling teams to assess the quality of the sampling effort and analytical data. QC samples collected include background samples, rinsate samples, field screening QA/QC samples, and confirmation samples.

### 2.7.1 Background Samples

Four background samples were collected to characterize background soil and sediment in order to establish baseline concentrations of analytes in road/pad gravel, peat sediment, stream sediment, and beach sediment (see Table 2-2). All of these samples were analyzed for Level IV TAL metals, BNA, VOC, pesticides/PCB, and dioxin. The analytical results of these background samples were compared to the results of samples collected at the VORTAC/DF, NDB/H-marker, and RCAG facilities and are discussed in the facility sections. Positive results from the background analyses are summarized in Tables 2-3, 2-4, and 2-5, and sample locations are presented on Figures 2-1 and 2-2. Data validation memorandum and laboratory reports are presented in Appendix A.

Background soil sample ANN94ESB-SD-101 was collected approximately 0.1 mile southeast of the NDB/H-marker building in an area upgradient of all known sources and represents the gravelly soil used to elevate roads and FAA structures above the muskeg (see Figure 2-2). Source samples collected from the VORTAC/DF and NDB/H-marker facilities were compared to this sample.

Analytical results indicated toluene at 56 micrograms per kilogram ($\mu$g/kg) and xylene at 6 $\mu$g/kg (see Table 2-3). Both of these compounds were also found in the rinsate blank and are suspected to be attributed to laboratory contamination. Most TAL metals were present in the sample at varying concentrations (see Table 2-4). No BNAs, pesticides, PCBs, or dioxins were detected in this sample.

Background sediment samples were collected in areas with similar ecological areas in drainages that appeared not to have been impacted by any contaminant sources. Background sediment sample ANN94ESB-SE-100, representative of background beach sediments, was collected in a stream channel at the beach south of the south end of the runway at the south end of the island, between the high and low water tide lines west of Grey Point (see Figure 2-2). The stream channel contained a gravelly sand substrate. No vegetation grew within or adjacent to the stream channel. Grass species grew on elevated areas of the beach. Target

beach sediment samples collected from the VORTAC/DF, NDB/H-marker, and RCAG facilities were compared to this sample.

Analytical results indicated low concentrations of toluene and xylene at 5 and 1 µg/kg, respectively (see Table 2-3). Both of these compounds were also found in the rinsate sample and are suspected to be attributed to laboratory contamination. TAL metals were also detected in this sample at varying concentrations (see Table 2-4). No other compounds were detected in this sample.

The background stream sediment sample ANN94ESB-SE-101 was also collected on the southern end of the island, west of Grey Point, but it was collected in a different stream channel than the background beach sample (see Figure 2-2). The stream substrate was a gravelly sandy soil. Skunk cabbage (*Lysichiton americanum*), sphagnum moss, false-lily of the valley (*Maianthephum dilatatum*), arrowhead *(Sagittaria latifolia)* were in the herbaceous layer on the stream banks. Salmonberry (*Rubus spectalalis*) and fool's huckleberry (*Menziesia ferruginea*) were in the shrub layer. Western redcedar (*Thuja plicata*), yellow cedar, and western hemlock occupied the tree stratum. The soil on the banks was an organic peat. This sample represents background stream sediment conditions. Target stream sediment samples collected at the VORTAC/DF, NBD/H-marker, and RCAG facilities were compared to this sample. TAL metals were detected in this background sediment sample at varying concentrations (see Table 2-4). No other compounds were detected in this sample.

The background peaty sediment sample ANN94ESB-SE-102 was collected west of the airport along Point Davison Road (see Figure 2-2). This sample was collected in a shore pine-yellow cedar-muskeg/open water wetland complex. The muskeg wetland contained deer cabbage (*Fauria crista-galli*), bog laurel, jeffrey shooting star (*Dodecatheon*), common juniper (*Junieris communis*), sphagnum moss, and grass species in the herbaceous layer. The shrub layer contained sweet gale (*Myrica gale*), labrador tea, yellow cedar, western redcedar, and shore pine. The tree layer contained yellow cedar, western redcedar, and shore pine. The soil was composed of organic peat material and was saturated. The open water wetland was vegetated with buckbean (*Menyanthis trifohata*). This sample represents background peat sediment conditions. Target peat sediment samples collected at the VORTAC/DF, NDB/H-marker, and RCAG facilities, and source samples collected at the RCAG facility were compared to this sample. Toluene and xylene were detected in this sample at 7 and 22 µg/kg, respectively (see Table 2-3). Both of these compounds were also detected in the rinsate and are suspected to be laboratory contamination. Several TAL metals were also detected in the

sample at varying concentrations (see Table 2-4). Additionally, low concentrations of several dioxin isomers were detected in this sample (see Table 2-5).

### 2.7.2 Rinsate Samples

Two reagent water and one dioxin hexane rinsate samples were collected to identify potential sources of cross-contamination from sampling equipment used on site. Results are presented in Tables 2-3, 2-4, and 2-5. Samples ANN94ESV-WA-100, ANN94ESV-WA-400, and ANN94ESN-HE-100 were collected following decontamination of a stainless-steel trowel used to collect surface soil and sediment samples. Sample ANN94ESV-WA-100 was submitted for Level IV analysis of TAL metals, BNA, VOC, pesticides/PCB, and dioxin. Sample ANN94ESV-WA-400 was submitted for Level III analysis of TRPH, DRO, and VPH-G. Sample ANN94ESN-HE-100 was a hexane rinsate submitted for Level IV dioxin analysis. All results for rinsate samples were below method detection limits (MDLs) with the following exceptions: ANN94ESV-WA-100 contained 12.4 micrograms per liter ($\mu$g/l) iron, 6 $\mu$g/l toluene, and 1.0 $\mu$g/l xylene. Low levels of these contaminants are likely due to laboratory contamination.

### 2.7.3 Level II Field Screening

Four types of field screening analyses were performed for the Annette Island FAA Station ESI including: XRF metals in soils; XRF lead in paint, ENSYS Petrol RISc analysis for petroleum hydrocarbons in soil, and ENSYS PCB RISc analysis for PCBs in wipe samples.

Field screening analyses protocols are presented in Appendix F and include sample preparation, instrument calibration, sample analysis, QA/QC samples, and QA/QC validation. XRF field screening methods follow the EPA Emergency Response Team (ERT) Standard Operating Procedures (SOP) for the Spectrace 9000 XRF. The ENSYS RISc analyses follow the appropriate ENSYS User Guides.

### 2.7.4 Level II Confirmation Samples

In addition to daily QA/QC procedures, some samples analyzed by field screening methods were submitted to fixed laboratories for confirmation of results. Samples analyzed for XRF metals in soil, petroleum hydrocarbons in soil, and PCBs in wipe samples were submitted to fixed laboratories for confirmation. XRF field screening results for metals may

be low compared to off-site laboratory confirmation results because water content in some samples was above the recommended 5% to 20% sample percent water in the XRF operating procedures.

#### 2.7.4.1 XRF Soil Confirmation Samples

Approximately 10% of the soil samples collected at the VORTAC/DF and NDB/H-marker facilities that were analyzed for metals with the XRF were also submitted to the Analytical Services Center (ASC) for total lead analysis per EPA Method SW-846. Since XRF reflects total lead concentrations and EPA Method SW-846 reflects acid digestible lead concentrations, a linear regression was performed for lead rather than a direct comparison of results. Twenty-nine samples collected from the VORTAC/DF (22 samples) and NDB/H-marker (seven samples) facilities were submitted for confirmation. A linear regression was performed for all 29 samples and yielded a relatively low correlation coefficient ($r = 0.78535$). Due to the gravel and ash soil matrix found at the NDB/H-marker, high sample heterogeneity was suspected for these samples. Therefore, a linear regression was again performed, but only for the 22 VORTAC/DF samples. This regression yielded a higher correlation coefficient ($r = 0.96068$), indicating the XRF and ASC lead results are strongly correlated. The slope was calculated to be 1.198 with an intercept of 103. Since the soil matrix at the VORTAC facility is relatively fine-grained and homogeneous, these analytical results are more accurately reproduced within an analytical method. In the same way, sample results from VORTAC samples would also yield a more accurate comparison of analytical methods. Therefore, this second regression more accurately describes the overall XRF method results as they relate to EPA Method SW-846 results for this ESI. The slope and intercept are further used below to estimate expected EPA Method SW-846 lead results from XRF screening lead results. For example, a 500 milligram per kilogram (mg/kg) SW-846 lead result would correlate to 331 mg/kg on the XRF. However, the XRF instrument reads directly in parts per million (ppm) and makes no adjustment to a dry weight basis as laboratory results are reported.

#### 2.7.4.2 ENSYS Confirmation Samples

All samples collected for ENSYS Petrol RISc analysis for petroleum hydrocarbons in soil and ENSYS PCB RISc analysis for PCBs in wipe samples were submitted to fixed laboratories for confirmation. Results are discussed in facility sections.

## 2.8 UPDATED MEDIA-SPECIFIC EVALUATION CRITERIA (MSECs) FOR FAA SITES

The MSECs were originally developed by E & E, Inc. when the RCRA Corrective Measures (CMS) Action Levels were EPA's only source of guidance on developing risk-based screening levels for environmental media. Consequently, the CMS action level calculations and assumptions were incorporated in the MSECs for screening contaminant concentrations at remote FAA sites in Alaska. Since that time, EPA's Superfund Program has refined its guidance on calculating risk-based screening levels for environmental media in the form of Risk Assessment Guidance for Superfund (RAGS), Part B (EPA 1991a). In addition, EPA Region 3 publishes risk-based concentrations (RBC) tables for various media that are based on the methodology described in RAGS, Part B, and EPA's standard default reasonable maximum exposure assumptions (EPA 1991b). The Region 3 RBC Table is updated quarterly to incorporate EPA's latest toxicological indices (reference doses [RfDs] and cancer slope factors [SF]) for chemicals and to add chemicals for which RfDs and Sfs have just become available. The Region 3 RBC table now includes nearly 600 chemicals. Because of is breadth of coverage, its frequent updates, and its ready availability, the Region 3 RBC Table is recommended as a source of screening criteria by several EPA regions, including Region 10. For these reasons, the MSECs will henceforth be based on the calculations, exposure assumptions, and RBC values in the current Region 3 RBC Table. The methodology used in calculating the RCRA CMS action levels and the Region 3 RBCs is essentially the same; however, there are minor differences in the receptors and exposure assumptions used in calculating the values. As noted earlier, the Region 3 RBCs incorporate EPA's standard default exposure assumptions and thus best reflect agency guidance on risk-based screening criteria.

The MSECs for soil are based on the Region 3 RBCs for residential soil and will continue to use a multiplier of 4 to adjust for the lower exposure frequency expected to occur at remote FAA stations in Alaska (see Table 2-6). The MSECs for other environmental media will be equal to the Region 3 RBCs for the same or comparable media.

MSECs were used to screen the analytical results for Annette Island to identify contaminants and areas that could have the potential to pose a significant risk of adverse human health effects. With the exception of lead, the MSECs were based on EPA Region 3 RBCs which incorporate EPA's standard default exposure assumptions. No RBC's are available for lead because EPA has been unable to derive verifiable reference doses or slope factors from the available toxicity data. Therefore the new soil screening level of 400 mg/kg

recommended in EPA's Office of Solid Waste and Emergency Response (OSWER) directive 9355.4-12 (EPA 1994) was used as the basis of the MSEC for lead. MSECs for soil for Annette Island were obtained by adjusting the standard EPA Region 3 RBCs for residential soil and the new lead screening level upward by a factor of 4 to reflect the climatic conditions in Alaska and more limited contact with contaminated areas than assumed for the standard RBCs and screening levels. For media other than soil, the EPA Region 3 RBCs were used as the MSECs without adjustment.

**Table 2-1**

**EXPANDED SITE INVESTIGATION/INTERIM CLEANUP
FIELD TEAM PERSONNEL
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA**

| Name | Role |
|---|---|
| **EXPANDED SITE INVESTIGATION** | |
| **Ecology and Environment, Inc.** | |
| Stuart Richardson | Project director |
| Dave Franzen | Project manager, field team leader |
| Mike Jones | Sampler, site safety officer |
| Annette Sackman | Chemist |
| Louise Flynn | Wetlands specialist |
| **NISC**- FAA Support Contractor | |
| Russell Renk | Contracting officer's representative |
| **INTERIM CLEANUP** | |
| **NISC**- FAA Support Contractor | |
| Russell Renk | FAA contracting officer's representative |
| **Ecology and Environment, Inc.** | |
| Dave Franzen | Project manager, field team leader |
| Louise Flynn | Sampler |
| Annette Sackman | Field chemist |
| **PENCO**- Remedial Subcontractor | |
| Don Orvis | Field worker |
| Doug Ferguson | Pilot |
| Rex Lumpkin | Project supervisor |

## Table 2-2

## FIELD QUALITY ASSURANCE SAMPLE SUMMARY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. | QA Use | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|---|
| ANN-94ESB-SD-101 | Background | Soil | BNA, Pest/PCB, TAL metals, VOC, Dioxin | ASC/Triangle Level IV | Background soil sample for the NDB and VORTAC facilities, collected of gravel road shoulder, 0.1 mile southeast of NDB. |
| ANN-94ESB-SE-100 | Background | Sediment | BNA, Pest/PCB, TAL metals, VOC, Dioxin | ASC/Triangle Level IV | Background beach sediment collected at the beach immediately south of the end of the runway. |
| ANN-94ESB-SE-101 | Background | Sediment | BNA, Pest/PCB, TAL metals, VOC, Dioxin | ASC/Triangle Level IV | Background stream sediment collected from a streambed flowing onto the beach where SE-100 was collected. |
| ANN-94ESB-SE-102 | Background | Sediment | BNA, Pest/PCB, TAL metals, VOC, Dioxin | ASC/Triangle Level IV | Background peat sediment collected 0.7 mile west of the south end of the runway. |
| ANN-94ESV-WA-100 | Rinsate | Water | Pest/PCB, TAL metals, VOC, BNA | ASC Level IV | Rinsate sample collected from a sampling trowel after decontamination. |
| ANN-94ESV-WA-400 | Rinsate | Water | DRO, TRPH, VPH-G | ASC Level III | Rinsate sample collected from a sampling trowel after decontamination. |
| ANN-94ESN-HE-100 | Rinsate | Hexane | Dioxin | Triangle Level IV | Rinsate sample collected from a sampling trowel after decontamination. |

Key:

ASC = Analytical Service Center.
BNA = Base neutral/acid extractable compounds.
DRO = Diesel-range organics.
Pest/PCB = Organochlorine pesticides/polychlorinated biphenyls.
TAL metals = Target Analyte List metals.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
VPH-G = Volatile petroleum hydrocarbons as gasoline.

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## Table 2-3

## FIELD QUALITY ASSURANCE SAMPLES (BACKGROUND, RINSATE, AND TRIP BLANKS) POSITIVELY IDENTIFIED ORGANIC COMPOUNDS ANNETTE ISLAND FAA STATION ANNETTE ISLAND, ALASKA

(soil in µg/kg, water in µg/l)

| Sample Number: / Compound | ANN94ESB-SD-101 (Background) | ANN94ESB-SE-100 (Background) | ANN94-ESB-SE-101 (Background) | ANN94ESB-SE-102 (Background) | ANN94ESV-WA-100 (Rinsate) |
|---|---|---|---|---|---|
| **VOC** | | | | | |
| Toluene | 56 | 5 J | ND | 7 J | 6 |
| Total Xylenes | 6 | 1 J | ND | ND | 1 |
| **BNA** | | | | | |
| bis(2-Ethylhexyl)phthalate | ND | ND | ND | ND | 2 |

Key:

BNA = Base neutral/acid extractable organic compound.
J = Result is estimated because it is below method detection limits.
µg/kg = Micrograms per kilogram.
µg/L = Micrograms per liter.
ND = Not detected at quantitation limits noted in parentheses.
SD = Soil sample.
SE = Sediment sample.
VOC = Volatile organic compounds.
WA = Water sample.

## Table 2-4

## FIELD QUALITY ASSURANCE SAMPLES (BACKGROUND, RINSATE)
## POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## (soil in mg/kg, water in µg/l)

| Sample Number: / Compound | ANN94ESB-SD-101 (Background) Soil | ANN94ESB-SE-100 (Background) Beach Sediment | ANN94ESB-SE-101 (Background) Stream Sediment | AN94ESB-SE-102 (Background) Peat | AN94ESV-WA-100 (Rinsate) |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | 9,420 | 5,090 | 3,110 | 959 | ND |
| Arsenic | 9.5 | 1.2 | 0.83 | ND | ND |
| Barium | 37.8 | 23.7 | 9.8 | 4.7 | ND |
| Beryllium | 0.21 | 0.14 | 0.08 | ND | ND |
| Calcium | 1,240 | 3,180 | 948 | 528 | ND |
| Chromium | 10.5 | 4.8 | 3.6 | 4.0 | ND |
| Cobalt | 18.1 | 4.1 | 4.0 | ND | ND |
| Copper | 13.0 | 6.8 | 8.9 | 1.5 | ND |
| Iron | 16,500 | 10,900 J | 8,560 J | 1,950 J | 12.4 |
| Lead | 4.7 | 4.2 J | 3.2 J | 4.8 J | ND |
| Magnesium | 23,100 | 3,570 | 2,360 | 446 | ND |
| Manganese | 247 | 122 | 94.8 | 7.4 | ND |
| Nickel | 95.5 | 4.8 | 5.1 | ND | ND |

Key at end of table.

## Table 2-4

## FIELD QUALITY ASSURANCE SAMPLES (BACKGROUND, RINSATE)
## POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## (soil in mg/kg, water in µg/l)

| Sample Number: / Compound | ANN94ESB-SD-101 (Background) Soil | ANN94ESB-SE-100 (Background) Beach Sediment | ANN94ESB-SE-101 (Background) Stream Sediment | AN94ESB-SE-102 (Background) Peat | AN94ESV-WA-100 (Rinsate) |
|---|---|---|---|---|---|
| Potassium | 630 | 701 | ND | ND | ND |
| Sodium | ND | 1,160 | ND | ND | ND |
| Vanadium | 31.8 | 17.7 | 10.6 | ND | ND |
| Zinc | 49.4 | 19.6 | 27.5 | ND | ND |

Key:

J = Estimated.
µg/L = Micrograms per liter.
mg/kg = Milligrams per kilogram.
ND = Not detected.
SD = Soil sample.
SE = Sediment sample.
WA = Water sample.

**Table 2-5**

**FIELD QUALITY ASSURANCE SAMPLES (BACKGROUND, RINSATE)
POSITIVELY IDENTIFIED DIOXIN ISOMERS
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(soil in ng/kg; liquid in ng/kg)**

| Sample Number: (ANN94-) / Compound | ESB-SD-101 Soil | ESB-SE-100 Beach Sediment | ESB-SE-101 Stream Sediment | ESB-SE-102 Peat | V-HE-100 (Hexane Rinsate) |
|---|---|---|---|---|---|
| **Dioxin Isomers** | | | | | |
| 1,2,3,4,6,7,8-HpCDD | ND | ND | ND | 35.4 | ND |
| OCDD | ND | ND | ND | 170 | ND |
| 1,2,3,4,6,7,8-HpCDF | ND | ND | ND | 6.49 | ND |
| TEF | 0 | 0 | 0 | 0.589 | 0 |
| Total PeCDD | ND | ND | ND | 29.0 | ND |
| Total HxCDD | ND | ND | ND | 68.1 | ND |
| Total HpCDD | ND | ND | ND | 35.4 | ND |
| Total TCDF | ND | ND | ND | 226 | ND |
| Total HpCDF | ND | ND | ND | 23.4 | ND |

Key:

HE = Hexane rinsate.
ND = Not detected.
ng/g = Nanograms per gram.
ng/kg = Nanograms per kilogram.
SD = Soil sample.
SE = Sediment sample.

## Table 2-6

## MEDIA-SPECIFIC EVALUATION CRITERIA—SOIL FOR ANALYTES WITH POSITIVE RESULTS

| Chemical | Value (mg/kg) | |
|---|---|---|
| **REGULATORY GUIDANCE VALUES** | | |
| **ADEC POLs** | | |
| Diesel Range | 100 | |
| Gasoline Range | 50 | |
| Benzene | 0.1 | |
| Total BTEX | 10 | |
| TRPH[a] | 2,000 | |
| **EPA Values** | | |
| Polychlorinated biphenyls | 25 | |
| Dioxins | 0.001 | |
| Lead | 400 | |
| | **RBC[b]** | **Calculated MSEC** |
| **Inorganics** | | |
| Antimony | 31 | 124 |
| Arsenic | 23 | 92 |
| Barium | 5,500 | 22,000 |
| Beryllium | 0.15 | 0.60 |
| Cadmium | 39 | 156 |
| Chromium | 78,000 | 312,000 |
| Copper | 2,900 | 11,600 |
| Mercury | 23 | 92 |
| Nickel | 1,600 | 6,400 |
| Selenium | 390 | 1,560 |
| Silver | 390 | 1,560 |
| Thallium | 5.5 | 22[c] |
| Zinc | 23,000 | 92,000 |
| **Organics** | | |
| Anthracene | 23,000 | 92,000 |
| Benzo(b)fluoranthene | 0.875 | 3.5 |
| alpha-BHC | 0.35 | 1.4 |



Key at end of table.

**Table 2-6**

**MEDIA-SPECIFIC EVALUATION CRITERIA—SOIL FOR ANALYTES WITH POSITIVE RESULTS**

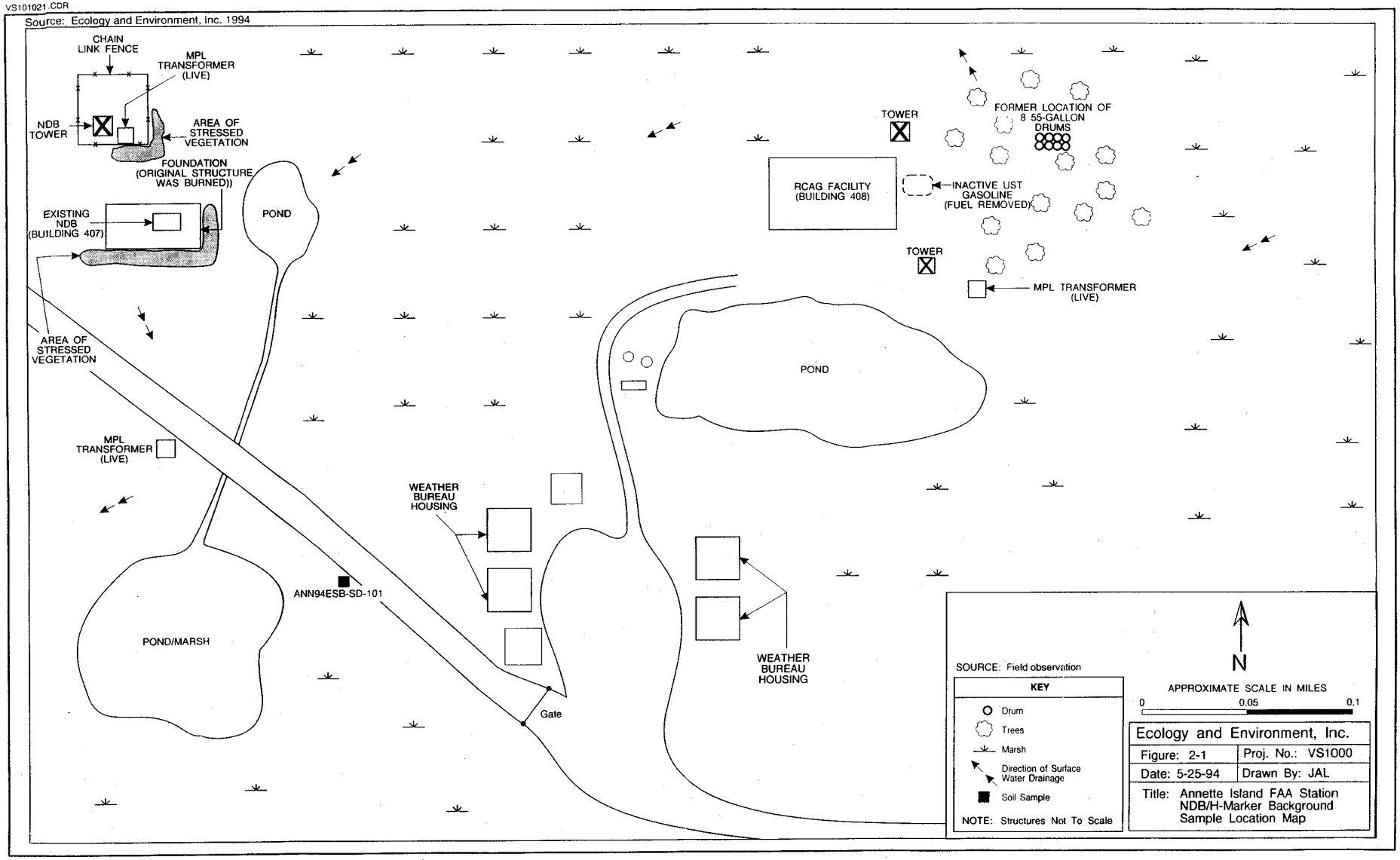
| Chemical | Value (mg/kg) | |
|---|---|---|
| Chloroform | 100 | 400 |
| Chrysene | 88 | 352 |
| Diethylphthalate | 63,000 | 252,000 |
| Fluoranthene | 3,100 | 12,400 |
| Phenanthrene | 3,100 | 12,400[d] |
| Pyrene | 2,300 | 9,200 |

[a] TRPH evaluation criterion is to be used only if DRO, VPH-G, benzene, or BTEX do not exceed their respective evaluation criteria.
[b] EPA, Region 3 RBCs.
[c] As thallium oxide.
[d] Value is based upon reference dose for naphthalene.

Key:

ADEC = Alaska Department of Environmental Conservation.
BTEX = Benzene, toluene, ethylbenzene, and xylene.
DRO = Diesel-range organics.
EPA = United States Environmental Protection Agency.
mg/kg = Milligrams per kilogram.
MSEC = Media-specific evaluation criteria
NS = No standard.
POLs = Petroleum, oil, and lubricants.
RBCs = Risk-based concentrations.
TRPH = Total recoverable petroleum hydrocarbons.
VPH-G = Volatile petroleum hydrocarbons-gasoline (gasoline-range organics).

VS101021.CDR



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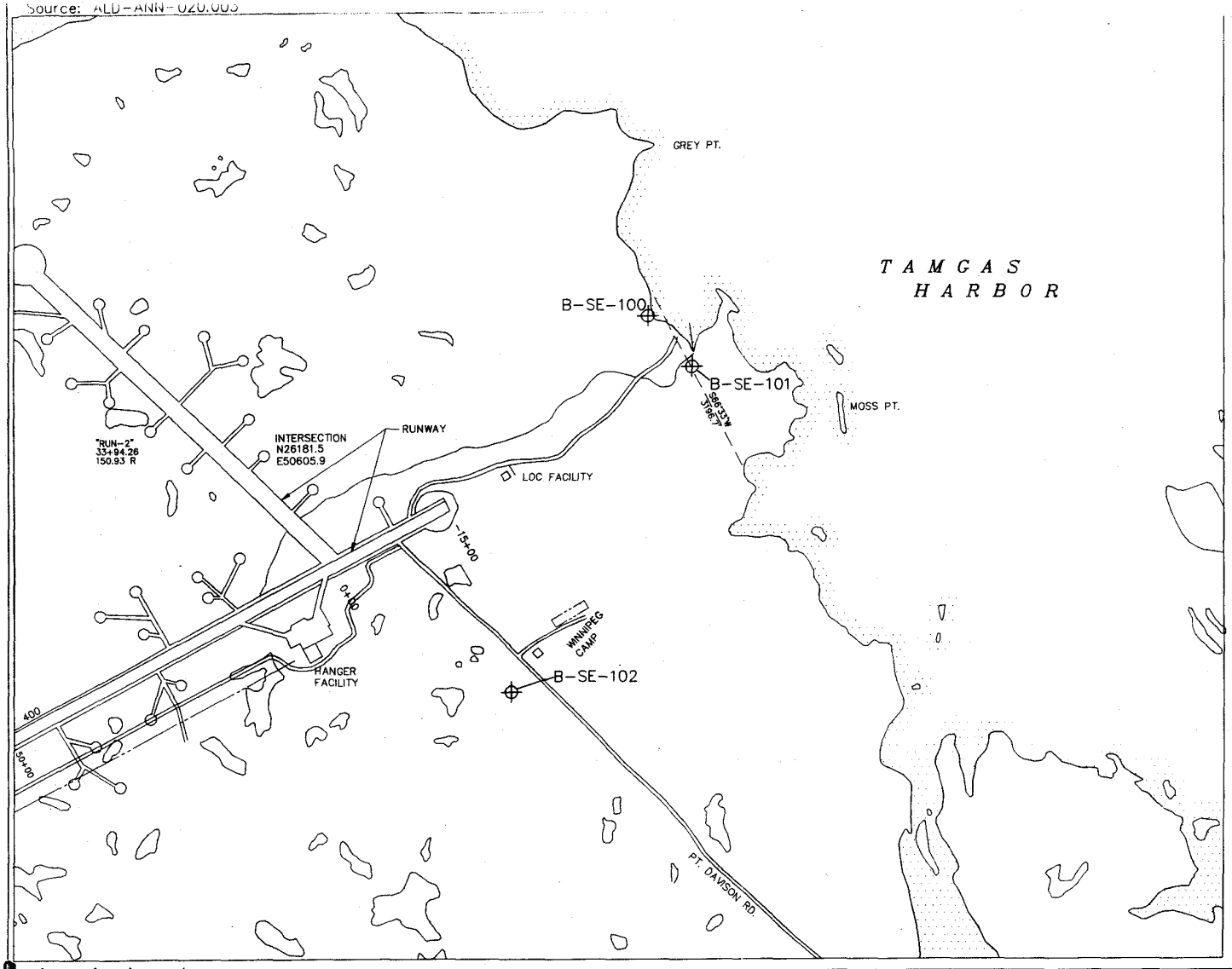
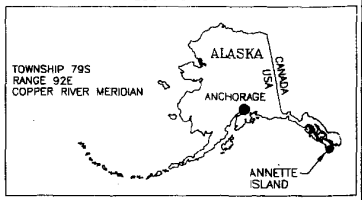



LOCATION MAP




LEGEND

Shores

B-SE-102 Sample Locations (ANN94-ES- )

N

APPROXIMATE SCALE IN FEET

0 500 1000 2000 3000

| Ecology and Environment Inc. | |
|---|---|
| Figure: 2-2 | Proj. No: VR1000 |
| Date: 9/08/94 | Drawn by: EGM |
| Title: ANNETTE ISLAND FAA STATION SEDIMENT BACKGROUND SAMPLE LOCATION MAP | |

ecology and environment

# 3. VORTAC/DF FACILITY

This section discusses the ESI and the IC field activities conducted at the VORTAC/DF facility. The location and a brief historical description of the VORTAC/DF and the sites investigated at this facility are discussed in Section 3.1. Section 3.2 discusses the ESI, including details of sampling activities, presentation of the analytical results, risk-based evaluation of contaminants, a geophysical survey, wetlands survey, deviations from the work plan, and conclusions and recommendations.

## 3.1 LOCATION AND DESCRIPTION

The VORTAC facility is an active aircraft navigation facility located on 91.82 leased acres approximately 1 mile northeast of the north end of the runway. The DF facility is also active and lies adjacent to the south side of the VORTAC/DF on 0.92 acre (see Figure 3-1). The VORTAC/DF facility has been operated by FAA since 1963.

The VORTAC/DF facility consists of a fenced gravel pad area, which includes the VORTAC Building 413, one active 1,000 gallon diesel UST; a live, high voltage transformer owned by MPL; a storage shed; and the adjoining property where the DF antenna, the VORTAC beacon tower, three tank foundations and piping, a hazardous materials storage building, and an active MPL transformer are located. The VORTAC building is a cinder-block structure built on a concrete foundation, with dimensions of approximately 30- by 30-feet. The roof is flat and covered with a tar and gravel mixture. The building is surrounded by a circular gravel pad that is elevated approximately 10 feet above the surrounding terrain and extends approximately 50 feet radially from the building. A chainlink fence has been constructed around the edge of the pad. An overhead steel antenna (ground plane) extends from the building roof to the fence and covers the gravel pad. A locked gate blocks entrance inside the fence at all times when the building is not occupied.

With the exception of the gravel pad and road, most of the adjoining property is covered by standing water and muskeg. The following structures are located outside of the fenced area: the DF antenna complex consisting of four towers located immediately northwest of the fence; the VORTAC beacon tower; three tank foundations and piping; a hazardous materials storage building; an active MPL transformer; and a gravel service road leading from the north end of the runway to the VORTAC building. A gate crosses the service road approximately 500 feet from the building. The gate is locked at all times when the VORTAC/DF facility is not occupied by authorized personnel.

An ECI conducted in August 1991 (E & E 1992b) identified the presence of lead in soil samples located on the west side of building 413 and beneath the fill port of the 1,000-gallon UST, which exceeded risk-based MSEC. The soil contamination next to building 413 also exceeded MSEC criteria. The lead contamination associated with the UST exceeded evaluation criteria established for petroleum, oil, and lubricants (POL) concerns. Additionally, contaminants in the TAL metal fraction exceeded the 3-times background concentrations. Both of these areas were targeted for further investigation in the ESI as stated in the FAA Statement of Work (SOW) dated September 29, 1993.

## 3.2 EXPANDED SITE INVESTIGATION

### 3.2.1 Level II Soil Grid Sampling

To determine the extent of lead contamination around Building 413, a radial sampling array was developed to cover the gravel pad (see Figure 3-2). A portion of this array was positioned over the area occupied by a former gasoline above-ground storage tank (AGT). The elevated lead and petroleum concentrations found during the ECI were suspected to have been caused by leaded gasoline usage or spillage, leaded paint overspraying, or chipped lead paint. As mentioned previously, the entire gravel pad is covered by a steel antenna structure. Flaking and sandblasted paint from this overhead structure was a likely source of lead found in the soil beneath it.

A minimum of six Level II surface soil samples were collected at intervals of: 0, 5, 10, 25, 47 (at the fenceline), and at 77 feet along each of eight radial lines extending from Building 413 and following the overhead structure of the antenna. Some samples were collected up to approximately 1 foot from the designated radial lines. The samples were analyzed for lead using a field portable XRF. Samples were prepared and analyzed according to the EPA SOP for the Spectrace 9000 field portable XRF (Appendices F.1). Where

elevated lead levels in excess of 500 mg/kg were found, a subsurface soil sample was collected 12-inches beneath the surface soil sample. A contingency was presented in the ESI to collect samples at a deeper 24-inch contour if lead concentrations greater than 500 mg/kg were found following XRF analysis of the 12-inch subsurface samples. None of the samples collected at the 12-inch depth exceeded 500 mg/kg; consequently, collection of the deeper samples was not required. The sample locations and corresponding sample numbers for all surface and subsurface soil samples are shown on Figure 3-2. Table 3-1 summarizes sample identification, matrices, and analyses.

The results of XRF lead analysis for all surface and subsurface sample locations are presented in Figure 3-3. The distribution of lead concentration in surface and subsurface soil was variable throughout the study area and ranged from not detected (ND) to 3,338 mg/kg. Generally, elevated lead concentrations were limited to surface soils except in samples collected around the UST, at the former gasoline AGT, and at the 5-foot interval on radial line 3. Elevated lead levels at the UST and former AGT locations are suspected to be POL-related. Subsurface lead levels at the 5-foot interval on radial line 3 may be due to an isolated spill of unknown material. Concentrations greater than 500 mg/kg were found at various locations inside the fenceline (47-foot contour). Lead levels greater than 1,000 mg/kg were found only on radial lines 1 and 3. Outside of the fenced area, at the 77 foot contour, XRF screening results indicated that lead was generally in the 100 to 500 mg/kg range. Since the elevated lead concentrations in surface soils were suspected to be caused by flaking paint and leaded paint overspraying, the exterior painted walls of VORTAC Building 413 were screened for lead in paint using the Spectrace 9000 XRF. Screening protocol for lead in paint analysis followed the EPA SOP for the Spectrace 9000 field portable XRF, which is presented in Appendix F.2. All four exterior cinderblock walls, painted with white paint that was in good condition, were screened with the XRF. Lead was not detected in the paint on any of the four walls.

Eight Level II surface and subsurface soil samples were also collected around the diesel UST and analyzed for lead and petroleum concentration for comparison to the MSECs. Samples were collected under the fill and vent pipes and on each side of the UST. Subsurface samples were collected at the same location as the surface samples, but at twelve inches below ground surface. XRF lead results ranged from 426 mg/kg to 81 mg/kg. The XRF lead analytical results are presented on Figure 3-3 and in Table 3-2. In addition to XRF, field screening of TRPH was also performed on these samples using the ENSYS Petro RISC test

methods. Samples were prepared and analyzed according to the protocol described in Appendix F.2. The results indicated that TRPH was not detected in any of the surface or subsurface soil samples.

### 3.2.2 Level III POL and Lead Sampling

Ten percent of the total samples collected for screening (Level II) analysis were submitted for Level III confirmation analysis to the analytical laboratory for the following parameters: BTEX, DRO, VPH-G, TRPH, and lead for comparison to MSEC and ADEC POL parameters. A sample summary is presented in Table 3-1. An ADEC POL matrix score and cleanup levels were calculated for the VORTAC/DF facility and are presented in Appendix D.

Four surface soil samples, collected along radial lines 1, 2, 3, and 8, exceeded the 400 mg/kg MSEC criteria for lead. Sample ANN94ESV-SD-414 (1,500 mg/kg) was collected on line 1, position 3; sample ANN94ESV-SD-406 (500 mg/kg) was collected on line 2 position 6; sample ANN94ESV-SD-413 (4,100 mg/kg) was collected on line 3, position 2; and sample ANN94ESV-SD-412 (520 mg/kg) was collected on line 8, position 6.

A statistical correlation was performed between the XRF Level II and TAL Level III lead results. Level III lead concentrations ranged from 14 to 4,100 ppm and were highly correlated with the Level II XRF results. The correlation coefficient was 0.961 indicating that the Level II screening procedure could be used to estimate the total lead concentration obtained using Level III laboratory analysis. A detailed discussion of the correlation of XRF lead to Level III lead values is presented in Section 2.7.4.

Low concentrations of TRPH, DRO, and VPH-G were found in the surface and subsurface soils collected around the UST, at maximum concentrations of 230 mg/kg, 220 mg/kg, and 5.5 mg/kg, respectively. The analytical results are presented in Table 3-3. None of the TRPH, DRO, VPH-G, or BTEX results were found to exceed the ADEC POL cleanup levels calculated on the ADEC matrix scoresheets (Appendix D). In addition, Level III lead concentrations exceeded the 400 mg/kg MSEC for lead for the following UST samples: ANN94ESV-SD-400 (610 mg/kg), ANN94ESV-SD-401 (1,200 mg/kg), ANN94ESV-SD-402 (510 mg/kg), ANN94ESV-SB-400 (580 mg/kg), ANN94ESV-SB-402 (460 mg/kg), and ANN94ESV-SB-403 (440 mg/kg). The results of the Level III lead analysis are presented by location on Figure 3-4 and in Table 3-3.

### 3.2.3 Level IV Source and Target Sampling

Potential source and surface water runoff routes for lead and other contaminants present at the gravel pad source area were assessed. Characterization of the gravel pad source area using Level II and Level III analysis has been previously described. In addition to the XRF field screening samples, Level IV source samples were collected from the area next to Building 413 where CERCLA contamination was identified during the ECI. The potential CERCLA source was characterized by submitting two surface and one shallow subsurface soil samples collected from the west side of Building 413. Surface soil sample ANN94ESV-SD-101 was collected near the northwest corner of the building. Collocated surface (ANN94ESV-SD-100) and subsurface (ANN94ESV-SB-100) soil samples were collected north of the ventilation duct. Due to the presence of a subsurface high-voltage power line, the ANN94ESV-SD-100 location was moved from next to the transformer (as planned in the ECI). The sample locations are presented in Figure 3-4 and Table 3-1. All three samples were submitted for Level IV analysis for TAL metals and Target Compound List (TCL) parameters (see Tables 3-4 and 3-5).

Surface source sample ANN94ESV-SD-100 and ANN94ESV-SD-101 were found to contain concentrations of metals at greater than three times background conditions. Calcium, chromium, copper, lead, magnesium, mercury, nickel, and zinc were found in ANN94ESV-SD-101. Analytical results are presented in Table 3-4. Total lead concentrations for samples ANN94ESV-SD-100 and ANN94ESV-SD-101 were 1,170 mg/kg and 2,260 mg/kg, respectively, which exceeded the MSEC criteria of 400 mg/kg. Zinc (166 mg/kg) was detected in subsurface sample ANN94ESV-SB-100 at concentrations that exceeded three times background or MSEC levels (see Section 3.2.5 for a complete discussion of the background samples). Sample results are presented on Figure 3-5 and in Table 3-4. No other compounds were detected in these samples at concentrations which exceeded three times background concentrations or MSEC levels.

In addition to these source samples, samples ANN94ESV-SD-412, ANN94ESV-SD-413, ANN94ESV-SB-413, ANN94ESV-SD-414, and ANN94ESV-SB-414, which were originally Level III samples, were submitted for reanalysis of Level IV TAL lead only in September 1994. This reanalysis was performed at FAA's request and was performed concurrently with a TCLP metals analysis (see Section 3.2.5). Samples ANN94ESV-SD-413 (6,020 mg/kg), ANN94ESV-SB-413 (467 mg/kg), and ANN94ESV-SD-414 (1,420 mg/kg)

exceeded the lead MSEC of 400 mg/kg. All of these samples exceeded three times background concentrations for lead. Results are presented in Table 3-4 and Figure 3-5.

The wetland adjacent to the VORTAC/DF facility was evaluated and met the criteria of a target wetland according to the HRS model. Two separate surface water pathways were identified at the VORTAC/DF extending northeast and southeast of the facility (see Section 3.2.7 for a complete discussion of the pathways). Sediment samples were collected at the probable point of entry into the wetland and at approximately 0.1 mile and 0.2 mile downgradient of the probable point of entry and gravel pad along each drainage pathway. The southeast pathway extended to Tamgass Harbor where a beach sample was collected at the beach at the end of the drainage. The beach sample was collected from a surface beach area at the mean tide line. Table 3-1 summarizes sample identification, matrix, analytical parameters, and sample descriptions. Sample locations are presented in Figure 3-6.

Six target samples were submitted for Level IV analysis of TAL metals and TCL parameters. Lead was found at concentrations greater than three times background at the probable point of entry to both drainage pathways (stream sediment ANN94ESV-SE-100, 10.9 mg/kg and peat sediment ANN94ESV-SE-103, 18.0 mg/kg). Calcium (4,650 mg/kg) and diethylphthalate (2,300 $\mu$g/kg) were found at greater than three times background in sample ANN94ESV-SE-100. Calcium and lead were also found in source samples at elevated concentrations. Diethylphthalate was not detected in source sample. The source of this compound is unknown.

Stream sediment ANN94ESV-SE-102, collected 0.2 mile downgradient of the VORTAC/DF facility in the northeast drainage, was found to contain aluminum and barium at 11,200 mg/kg and 29.6 mg/kg, respectively. These concentrations were greater than three times background stream sediment conditions. Aluminum and barium were found to be present in source samples and in ANN94ESV-SE-101, collected 0.1 mile downgradient, but not at concentrations that exceeded three times background. Therefore, it does not appear the VORTAC/DF facility is the source of these compounds.

Beach sediment ANN94ESV-SE-106 was collected at Tamgass Harbor along the southeast surface water pathway. Arsenic (4.8 mg/kg), chromium (37.5 mg/kg), cobalt (21.5 mg/kg), iron (21,500 mg/kg), magnesium (44,400 mg/kg), manganese (266 mg/kg), nickel (151 mg/kg), sodium (1,380 mg/kg), vanadium (16.8 mg/kg), and zinc (88.6 mg/kg) were all found to exceed three times background beach sediment conditions. Most of these elements were found in source samples at greater than three times background conditions. However,

elemental concentrations found in sediment samples ANN94ESV-SE-103, ANN94ESV-SE-104, and ANN94ESV-SE-105, collected upgradient of ANN94ESV-SE-106, were not detected or were at lower concentrations than those found in the beach sample. Therefore, it does not appear that the VORTAC/DF facility is the source of these contaminants at the beach.

### 3.2.4 Background Samples

Background samples were collected for each distinct sample matrix sampled. The matrices encountered at the VORTAC/DF facility included soil/gravel, sandy stream sediment, peaty sediment, and beach sand. The background sample locations were selected in upgradient areas as far removed from potential contaminant sources as practicable. The soil/gravel background sample ANN94ESB-SD-101 was collected near the NDB/H-marker facility as shown in Figure 2-1. All other background sample locations are shown in Figure 2-2. Sample designations are as follows: sandy stream sediment, ANN94ESB-SE-101; peaty sediment, ANN94ESB-SE-102; and beach sand sediment, ANN94ESB-SE-100. The background samples were analyzed for all TAL metals and TCL parameters. The results of the analysis are presented in Table 2-4 for TAL metals and Table 2-3 for TCL organic analytes. Background sample results are discussed in further detail in Section 2.7.1.

### 3.2.5 Level IV TCLP Sampling

Source samples ANN94ESV-SD-100, ANN94ESV-SD-101, and ANN94ESV-SB-100 were also submitted for Level IV TCLP metals analysis. Samples ANN94ESV-SB-412, ANN94ESV-SD-413, ANN94ESV-SB-413, ANN94ESV-SD-414, and ANN94ESV-SB-414 were submitted for Level IV TCLP lead only analysis in September 1994 after the field work was completed and at the request of FAA. These results are presented in Table 3-6 and in Figure 3-5. Samples ANN94ESV-SD-412, ANN94ESV-SD-413, ANN94ESV-SB-413, ANN94ESV-SD-414, and ANN94ESV-SB-414 were also submitted for reanalysis for Level IV TAL lead concurrent with the TCLP analysis for comparison purposes. Results are presented on Figure 3-5 and on Table 3-4. TCLP analysis indicated that only lead exceeded regulatory limits (5.0 milligrams per liter [mg/l]). The exceedance occurred in four surface soil samples ANN94ESV-SD-100 (5.7 mg/l), ANN94ESV-SD-101 (11.1 mg/l), ANN94ESV-SD-413 (65.2 mg/l), ANN94ESV-SD-414 (8.1 mg/kg), and in one subsurface samples ANN94ESV-SB-413 (5.2 mg/l). A comparison of Level IV total lead to TCLP lead in the source samples is as follows: ANN94ESV-SD-100, total 1,170 mg/kg, TCLP 5.7 mg/L;

ANN94ESV-SD-101, total 2,260 mg/kg, TCLP 11.1 mg/L; ANN94ESV-SB-100, total 0.6 mg/kg, TCLP 0.87 mg/L; ANN94ESV-SD-412, total 349 mg/kg. TCLP not detected; ANN94ESV-SD-413, total 6,020 mg/kg, TCLP 65.2 mg/l; ANN94ESV-SB-413, total 467 mg/kg, TCLP 5.2 mg/l; ANN94ESV-SD-414, total 1,420 mg/kg, TCLP 8.1 mg/l; and ANN94ESV-SB-414, total 69.3 mg/kg, TCLP 0.28 mg/l. TCLP lead concentrations are presented on Figure 3-5.

### 3.2.6 Wetlands Survey

At the VORTAC/DF facility, a wetland complex was identified immediately surrounding the gravel pad source area. The VORTAC/DF sits on a circular gravel pad. The wetland complex began near the base of the gravel pad and extended in all directions more than 0.2 mile downgradient of the gravel pad source. This complex was dominated by a shore pine-Yellow cedar muskeg with interspersed open water wetlands. The sloping sides of the gravel pad were covered with a thin layer of organic material. Upland species (white clover [*Trifolium repens*], dandelion [*Taraxacum officinale*], yarrow [*Achillea millefolium*], fireweed [*Epilobium anugustifolium*], thimbleberry [*Rubus parviflorus*], common horsetail [*Equisetum arvense*], dwarf dogwood [*Cornus canadensis*], salmonberry, evergreen huckleberry [*Vaccinium ovatum*], dominated the sloping sides of the gravel pad and were mixed with hydrophytic vegetation near the base of the pad. Since the VORTAC/DF sits on a flat circular pad, overland runoff could occur in any direction. Two drainage pathways were selected to be sampled based on their proximity to the gravel pad source. The northwest and southeast surface water paths are shown in Figure 3-6.

The northwest surface water pathway began at the base of the pad immediately downgradient of Radial Line 1 at the VORTAC and extended in a northwesterly direction. ANN94ESV-SE-100 was collected near the base of the pad. No tree stratum existed at this location. Sweet gale, labrador tea, yellow cedar, shore pine, and evergreen huckleberry comprised the sapling/shrub layer. The herbaceous layer contained numerous grass species, deer cabbage, common juniper, dwarf dogwood, sitka burnet *(Sanguisorba canadensis)*, fireweed, common horsetail, and sphagnum moss. The soil was composed of peat and was saturated at 6 inches BGS.

The northwest surface water pathway crossed the road near the road adjacent to the towers at the VORTAC/DF and entered an open water wetland vegetated with buckbean, sedges, and reeds. The land gently sloped northwestward from the open water wetland.

ANN94ESV-SE-101 was collected where the land plateaus. No tree stratum existed at this location. The shrub/sapling layer was composed of shore pine and labrador tea. Deer cabbage, bog laurel, jeffrey shooting star, crowberry, sitka burnet, common juniper, sphagnum moss, and numerous grass species dominated the herbaceous layer. The soil consisted of 4 inches of peaty muck overlaying a cobble layer and was saturated at the surface. Pockets of standing water were intermingled with this muskeg wetland.

The northwest surface water pathway followed the slope of the hill. Downgradient of the previous sampling point, the angle of the slope increased and channels became more prevalent. ANN94ESV-SE-102 was collected in a channel. The vegetation was consistent with that found at the previous sampling point. The channel substrate consisted of 12 inches of peaty muck overlying rock. The channel banks consisted of 4 to 6 inches of peat over rock.

The southeast surface water pathway began at the base of the gravel pad of the VORTAC immediately downgradient of Radial Line 3. This drainage pathway initially headed southeast for approximately 100 feet and then followed an easterly direction towards Tamgass Harbor. ANN94ESV-SE-103 was collected near the base of the pad in an apparent dry drainage channel. No tree stratum existed at this location. The shrub/sapling layer consisted of sweet gale, yellow cedar, shore pine, and labrador tea. Deer cabbage, sitka burnet, dwarf dogwood, crowberry, bog laurel, and sphagnum moss comprised the herbaceous layer. The soil consisted of an organic peat mixed with silty sand.

The southeast surface water pathway continued down the slope of the hill in an easterly direction. Channels developed where the angle of the slope increased and disappeared as the land leveled. Open water wetland were more prevalent in the flatter area. ANN94ESV-SE-104 was collected in a drainage channel approximately 0.1 mile downgradient of the gravel pad source and immediately downgradient of two large open water wetlands. No tree stratum existed at this location. Shore pine, sweet gale, and labrador tea dominated the shrub/shrub layer. Deer cabbage, common juniper, and jeffrey shooting star were the dominant vegetation in the herbaceous layer. Buckbean and grasses were the dominant vegetation in the channel itself. The sampling location was inundated. The channel substrate consisted of 12 inches of muck, contained some sand and silt, underlain by an impermeable layer. The adjacent bank consisted of at least 18 inches of peat.

ANN94ESV-SE-105 was collected approximately 0.2 mile downgradient of the source along the southeastern drainage pathway. The surrounding vegetation consisted of shore pine,

sweet gale, and labrador tea in the shrub/sapling layer; and common juniper, sitka burnet, deer cabbage, and grasses in the herbaceous layer. Buckbean was the dominant plant in the open water wetland. The soil in the open water wetland consisted of 8 inches of peaty muck over a hard pan. The surrounding soil was saturated to the surface and consisted of a mucky peat and sphagnum moss. The soil consisted of four inches of saturated peaty muck overlying a rock or gravel. Open water areas contained buckbean and several grass and sedge species and consisted of a muck substrate overlying gravel.

The area surrounding the VORTAC/DF had extensive drainage patterns. Channels occurred on sloped terrain and subsequently disappeared into marshes or open water areas. The predominant drainage was towards the east and drained into Tamgass Harbor, south of Tent Point. A beach sample (ANN94ESV-SE-106), consisting of sand and gravel, was collected between the low and high tide marks within the channel identified as the primary surface flow from the drainage. No vegetation was observed growing on the beach.

### 3.2.7 Site-Specific Remedial Goals

As discussed previously in Section 2.8, MSECs were developed to screen the analytical results and to identify contaminants and areas that could have the potential to pose a significant risk of adverse human health effects. Lead was the only contaminant with a range of concentration in soil at the VORTAC/DF that exceeded the conservative MSECs, therefore it was the only one requiring a site-specific remedial goal. EPA has been unable to derive a verifiable reference dose or slope factor from the available toxicity data for lead, partly because of a lack of empirical evidence for a threshold for many of lead's noncarcinogenic effects. Consequently, lead exposures are usually assessed using EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK), which integrates exposure and biokinetic factors to predict the distribution of blood lead levels as a function of lead concentration in soil, dust, water, food, and air. The projected distribution is then compared to a target distribution that is expected to be adequately protective for the receptors under consideration, usually young children. The degree of exposure to these media and the extent of lead uptake from the media are considerably greater for young children than for adults. The factors used in the model would be appropriate for young children residing in the exposure area, but would substantially overestimate blood levels for adults. For this reason, the new soil screening level of 400 mg/kg recommended in EPA's OSWER directive 9355.4-12 (EPA 1994) was used as a

starting point for developing a site-specific remedial goal for lead, but was adjusted to consider the population and environmental conditions at Annette Island.

The potentially exposed population consists of on-site workers and residents living on Annette Island. Information provided in the ECIR (E & E 1992b) indicated that the worker population consisted of 4 people who work periodically at each of the operating FAA facilities, the VORTAC/DF, NDB/H-marker, and RCAG. The typical work schedule involves maintenance personnel visiting each facility once per month and on an as needed basis. It is estimated that the FAA workers spend less than 5% of their monthly work shift at the Annette Island facilities.

Residents living on the island consist of the people living in Metlakatla (630), which is located approximately 5 miles north of the FAA Station, and those living near the FAA facilities. It was estimated in the ECIR that 61 people live or work within 1 to 2 miles of the VORTAC/DF facility. The population living nearest to the FAA station were at the Weather Bureau Housing (WBH) area, located between the NDB/H-marker and RCAG facilities (see Figure 2-1). At the time of the ECI, 15 people, including adults and children, were living in the WBH area.

Although children live on Annette Island, primarily in Metlakatla and the WBH area, exposure to contaminated soil at the VORTAC/DF facility is unlikely due to the remoteness, inaccessibility and secure nature of the facility. The VORTAC/DF facility is located approximately 1 mile from the WBH area and 5 miles from Metlakatla. In addition, as mentioned in Section 3.1, access to the gravel pad where elevated lead concentrations were found has been restricted: first by a locked gate on the access road and second by a secured fence that surrounds the top of the gravel pad, where most of the lead contamination was found.

Although the IEUBK model is not directly relevant to adults or the potential exposure situation on Annette Island, it does provide a starting point for qualitative assessment of potential lead exposure. The first consideration is that the 400 mg/kg soil screening level based on the IEUBK model is explicitly an average concentration for a potential exposure area. The average lead concentration at the VORTAC/DF was calculated based on both level II screening and Level III confirmation data. The Level II samples were collected on a grid that characterized the entire source area, and as such were probably more representative of the area. A subset of these samples, which represented soil in the overland surface water pathway, were selected and submitted for Level III confirmation analysis. The average surface lead concentration at the VORTAC/DF facility was 733 mg/kg, based on Level III

analysis. The Level II results were consistently lower than, but highly correlated (r = 0.96) to, the corresponding Level III values. The average Level II concentration was 444 mg/kg, which correlates to a 636 mg/kg Level III average (see Section 2.7.4.1 for a discussion of the correlation).

The 400 mg/kg screening level is considered adequately protective for continuous exposure of young children to soils in a residential setting. The potential exposure situation for workers in the VORTAC/DF facility area differ in two important ways from the situation for which the screening level was intended. First, based on their work schedules, it is likely that less than 25% of the workers total soil contact is to contaminated soil in the VORTAC/DF area. This differs from the 100% contact with contaminated soils assumed in the IEUBK model. Second, the potentially exposed individuals are adults rather than children. A recent study by Bowers, *et al.* (1994) involving adult workers occupationally exposed to lead in Butte, Montana, and Midvale, Utah, indicates that uptake of lead from soil is less than one-third as great in adults as in young children. This means that adults can tolerate soil lead levels three times higher than young children and still have the same blood lead levels. Taken together, these two factors suggest that a soil lead level as much as 60 times higher than 400 mg/kg could be adequately protective for the FAA employees who maintain the VORTAC/DF facility. In contrast, the actual average lead concentration measured in the VORTAC/DF area was less than two times higher than the 400 mg/kg screening level.

The foregoing description of the VORTAC/DF area and the potential for human exposures to soils in that area that might reasonably be expected to indicate that the existing soil lead levels would not result in any adverse health effects, and that there is already a considerable margin of safety. Therefore, no site-specific remedial goal is needed for lead for the VORTAC/DF facility area on Annette Island.

Given the nature of the potentially exposed population and the degree of exposure that might reasonably be expected to occur at the VORTAC/DF, the lead MSEC, based on the standard EPA Region 3 RBC for residential soil, was adjusted upward by a factor of 4 to 1,600 mg/kg. This adjustment assumes that the exposed population, either children or workers, would spend at least 1/4 of their time in contact with the contaminated soil. Realistically, exposure at the VORTAC/DF would probably be less than 25 % due to the remoteness and inaccessibility of the facility. Although this assumption of exposure frequency is overly protective for the VORTAC/DF, it was chosen to provide a margin of safety at all

FAA facilities located on Annette Island. The average lead soil concentration at the VORTAC/DF did not exceed 1,600 mg/kg; consequently, the existing lead concentrations found in the soils at the VORTAC/DF facility on Annette Island do not appear to pose a significant risk of adverse health effects.

### 3.2.8 Deviations From the Work Plan

All work at the VORTAC/DF facility was performed as specified in the ESI work plan except that an additional surface water runoff pathway was identified that required the collection of three additional sediment samples and one additional beach sample to characterize the pathway. The two pathways were discussed in Section 3.2.1.3. All deviations from the work plan were authorized by the Contracting Officer (CO).

### 3.2.9 Conclusions and Recommendations

The issues of concern at the VORTAC/DF were the presence of contamination in soil, the exceedance of regulatory criteria and the potential for exposure to the contamination. The results of the investigation are summarized as follows:

- Lead contamination found in surface soil in the gravel pad source area had a range of concentration that exceeded the MSEC. TCLP analysis indicated that the lead in these samples also exceeded the 5 mg/l regulatory criteria. Approximately 300 cubic yards of soil are potentially affected assuming contaminants are in the top six inches of soil across the gravel pad. Further action is recommended to address the lead contamination at the VORTAC/DF facility.

- An assessment of the potential exposure to the lead contamination indicated that it did not pose a significant risk of adverse health effects.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-100 | Soil | BNA, TAL metals, TCLP metals, VOC, Pest/PCB | ASC/Level IV | Source sample; collected on west side of Building 413. |
| ESV-SB-100 | Soil | BNA, Pest/PCB, TAL metals, TCLP metals, VOC | ASC/Level IV | Source sample; collected at same location as SD-100 at 1 foot BGS. |
| ESV-SD-101 | Soil | BNA, Pest/PCB, TAL metals, TCLP metals, VOC | ASC/Level IV | Source sample; collected on west side of Building 413. |
| ESV-SE-100 | Stream sediment | BNA, Pest/PCB, TAL metals, VOC | ASC/Level IV | Northeast drainage. Entrance to wetland. |
| ESV-SE-101 | Stream sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Northeast drainage. Wetland 0.1 mile downstream of VORTAC. |
| ESV-SE-102 | Stream sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Northeast drainage. Wetland 0.2 mile downstream of VORTAC. |
| ESV-SE-103 | Peat sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Southwest drainage. Entrance to wetland. |
| ESV-SE-104 | Stream sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Southwest drainage. Wetland 0.1 mile downstream of VORTAC. |
| ESV-SE-105 | Stream sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Southwest drainage. Wetland 0.2 mile downstream of VORTAC. |
| ESV-SE-106 | Beach sediment | BNA, Pest/PCB TAL metals, VOC | ASC/Level IV | Beach at end of drainage. |
| ESV-SD-200 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SB-200 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-201 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-209 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-210 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-210 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-232 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-224 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-250 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-203 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-201 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-204 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-205 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-211 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-233 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-225 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-251 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-206 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-203 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-207 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SB-212 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location. |
| ESV-SD-208 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-234 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-234 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-226 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-226 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-252 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-209 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-204 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-210 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-213 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |

Key at end of table.

**Table 3-1**

**EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
VORTAC FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA**

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-211 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-214 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-235 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-235 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-227 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-253 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-212 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-205 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-213 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-214 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-215 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-236 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-236 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-228 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-254 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-215 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-206 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-216 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-217 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-237 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-237 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-229 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-255 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-218 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-207 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-219 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-220 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-238 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-230 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-256 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-221 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-208 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-222 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-223 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-239 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SB-239 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-231 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-257 | Soil | XRF metals | Field/Level II | See Figure 3-2 for grid location |
| ESV-SD-240 | Soil | XRF metals, TRPH | Field/Level II | Fill pipe at UST |
| ESV-SB-240 | Soil | XRF metals, TRPH | Field/Level II | Fill pipe at UST, 1 foot BGS |
| ESV-SD-241 | Soil | XRF metals, TRPH | Field/Level II | South side of UST |
| ESV-SB-241 | Soil | XRF metals, TRPH | Field/Level II | South side of UST, 1 foot BGS |
| ESV-SD-242 | Soil | XRF metals, TRPH | Field/Level II | Vent pipe at UST |
| ESV-SB-242 | Soil | XRF metals, TRPH | Field/Level II | Vent pipe at UST, 1 foot BGS |
| ESV-SD-243 | Soil | XRF metals, TRPH | Field/Level II | North side of UST |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SB-243 | Soil | XRF metals, TRPH | Field/Level II | North side of UST, 1 foot BGS |
| ESV-SD-400 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | Field/Level II | Same location as ESV-SD-240 |
| ESV-SB-400 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SB-240 |
| ESV-SD-401 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SD-241 |
| ESV-SB-401 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SB-241 |
| ESV-SD-402 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SD-242 |
| ESV-SB-402 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SB-242 |
| ESV-SD-403 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SD-243 |
| ESV-SB-403 | Soil | Total lead, TRPH, DRO, VPH-G, BTEX | ASC/Level III | Same location as ESV-SB-243 |
| ESV-SD-414 | Soil | Total lead, TCLP lead, TAL lead | ASC/Level III,IV | Line 1, 10 feet, surface sample. |
| ESV-SB-414 | Soil | Total lead, TCLP lead, TAL lead | ASC/Level III,IV | Line 1, 10 feet, subsurface sample 1 foot BGS. |
| ESV-SD-405 | Soil | Total lead | ASC Level III | Line 1, 77 feet, surface sample. |
| ESV-SD-406 | Soil | Total lead | ASC Level III | Line 2, 77 feet, surface sample. |
| ESV-SD-413 | Soil | Total lead, TCLP lead, TAL lead | ASC Level III, IV | Line 3, 5 feet, surface sample. |
| ESV-SB-413 | Soil | Total lead, TCLP lead, TAL lead | ASC Level III, IV | Line 3, 5 feet, subsurface sample 1 foot BGS. |

Key at end of table.

## Table 3-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESV-SD-404 | Soil | Total lead | ASC Level III | Line 3, 47 feet, surface sample. |
| ESV-SB-404 | Soil | Total lead | ASC Level III | Line 3, 47 feet, subsurface sample 1 foot BGS. |
| ESV-SD-407 | Soil | Total lead | ASC Level III | Line 3, 77 feet, surface sample. |
| ESV-SD-408 | Soil | Total lead | ASC/Level III | Line 4, 77 feet, surface |
| ESV-SD-409 | Soil | Total lead | ASC/Level III | Line 5, 77 feet, surface |
| ESV-SD-410 | Soil | Total lead | ASC/Level III | Line 6, 77 feet, surface |
| ESV-SD-411 | Soil | Total lead | ASC/Level III | Line 7, 77 feet, surface |
| ESV-SD-412 | Soil | Total lead, TCLP lead, TAL lead | ASC/Level III, IV | Line 8, 77 feet, surface |

Key:

ASC = Analytical Service Center.
BGS = Below ground surface.
BNA = Base neutral/acid extractable compounds.
BTEX = Benzene, toluene, ethylbenzene, and xylene.
DRO = Diesel-range organics.
Pest/PCB = Organochlorine pesticides/polychlorinated biphenyls.
TAL metals = Target Analyte List metals.
TCLP = Toxicity Characteristic Leaching Procedure.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
VPH-G = Volatile petroleum hydrocarbons as gasoline.

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## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 1 | Grid Point 1 | | Grid Point 2 | | Grid Point 3 | | Grid Point 4 | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-200 | ESV-SB-200 | ESV-SD-201 | ESV-SB-209 | ESV-SD-202 | ESV-SB-210 | ESV-SD-232 | ESV-SD-224 at Fence | ESV-SD-250 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 5 Feet | 10 Feet | 10 Feet | 36 Feet | 46 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 inches | 0 Inches | 0 Inches |
| Chromium | 830 | 357 | 730 | 509 | 843 | 356 | 755 | 623 | 231 |
| Manganese | 1,252 | 594 | 1,042 | 756 | 1,085 | 696 | 1,266 | 905 | 409 U |
| Iron | 44,234 | 25,604 | 37,821 | 29,267 | 45,578 | 25,990 | 53,389 | 30,948 | 8,405 |
| Cobalt | 472 | 236 | 544 | 304 | 504 | 174 U | 587 | 473 | 174 U |
| Nickel | 757 | 222 | 605 | 303 | 805 | 245 | 952 | 446 | 26 U |
| Copper | 242 | 49 U | 143 | 49 U | 79 | 49 U | 54 | 49 U | 49 U |
| Zinc | 386 | 91 | 335 | 69 | 409 | 64 | 200 | 3,174 | 70 |
| Arsenic | 75 U | 33 U | 68 U | 33 U | 121 U | 33 U | 33 U | 35 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 3 | 3 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 746 | 261 | 678 | 48 | 1,208 | 43 | 204 | 348 | 98 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 2 | Grid Point 1 | | Grid Point 2 | Grid Point 3 | | Grid Point 4 | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-203 | ESV-SB-201 | ESV-SD-204 | ESV-SD-205 | ESV-SB-211 | ESV-SD-233 | ESV-SD-225 Fence | ESV-SD-251 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 10 Feet | 10 Feet | 29 Feet | 49 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 0 Inches |
| Chromium | 883 | 269 | 751 | 627 | 312 | 615 | 787 | 182 |
| Manganese | 966 | 521 | 1,145 | 1,126 | 569 | 885 | 1,024 | 1,140 |
| Iron | 38,601 | 22,442 | 41,524 | 45,784 | 25,415 | 40,397 | 42,994 | 10,033 |
| Cobalt | 481 | 283 | 502 | 477 | 174 U | 512 | 604 | 174 U |
| Nickel | 594 | 176 | 732 | 788 | 138 | 684 | 773 | 89 |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 89 | 71 | 228 | 245 | 30 U | 186 | 214 | 40 |
| Arsenic | 33 U | 33 U | 45 U | 50 U | 33 U | 41 U | 40 U | 37 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 20 | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 3 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 24 | 33 | 453 | 501 | 14 U | 409 | 403 | 373 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 3 | Grid Point 1 | | Grid Point 2 | | Grid Point 3 | Grid Point 4 | | Grid Point 5 | | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-206 | ESV-SB-203 | ESV-SD-207 | ESV-SB-212 | ESV-SD-208 | ESV-SD-234 | ESV-SB-234 | ESV-SD-226 Fence | ESV-SB-226 Fence | ESV-SD-252 |
| Distance: Depth BGS: | 0 Feet 0 Inches | 0 Feet 12 Inches | 5 Feet 0 Inches | 5 Feet 12 Inches | 10 Feet 0 Inches | 30 Feet 0 Inches | 30 Feet 12 Inches | 48 Feet 0 Inches | 48 Feet 12 Inches | 77 Feet 0 Inches |
| Chromium | 346 | 178 U | 360 | 286 | 324 | 733 | 365 | 495 | 178 U | 178 U |
| Manganese | 1,054 | 486 | 607 | 409 U | 709 | 1,080 | 620 | 946 | 483 | 433 |
| Iron | 32,487 | 19,291 | 26,925 | 14,815 | 33,106 | 42,370 | 22,317 | 34,742 | 25,345 | 20,296 |
| Cobalt | 318 | 293 | 270 | 200 | 356 | 580 | 174 U | 459 | 330 | 174 U |
| Nickel | 372 | 122 | 295 | 132 | 543 | 746 | 76 | 602 | 230 | 26 U |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 189 | 50 | 1,138 | 97 | 190 | 194 | 65 | 1,397 | 320 | 50 |
| Arsenic | 50 U | 33 U | 334 U | 33 U | 40 U | 84 U | 33 U | 52 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 501 | 25 | 3,338 | 213 | 401 | 845 | 18 | 519 | 96 | 107 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 4 | Grid Point 1 | | Grid Point 2 | | Grid Point 3 | | Grid Point 4 | | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-209 | ESV-SB-204 | ESV-SD-210 | ESV-SB-213 | ESV-SD-211 | ESV-SB-214 | ESV-SD-235 | ESV-SB-235 | ESV-SD-227 Fence | ESV-SD-253 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 5 Feet | 10 Feet | 10 Feet | 30 Feet | 30 Feet | 39 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 Inches | 0 Inches |
| Chromium | 781 | 357 | 795 | 282 | 854 | 336 | 683 | 365 | 475 | 178 U |
| Manganese | 1,520 | 409 U | 1,237 | 509 | 912 | 455 | 1,261 | 889 | 1,009 | 409 U |
| Iron | 91,844 | 17,334 | 49,693 | 26,810 | 44,847 | 23,046 | 46,245 | 29,316 | 40,065 | 14,883 |
| Cobalt | 754 | 211 | 440 | 354 | 323 | 245 | 609 | 274 | 498 | 174 U |
| Nickel | 970 | 129 | 808 | 304 | 853 | 318 | 695 | 292 | 591 | 79 |
| Copper | 286 | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 817 | 36 | 250 | 56 | 229 | 35 | 232 | 101 | 3,824 | 30 U |
| Arsenic | 33 U | 33 U | 70 U | 33 U | 60 U | 33 U | 69 U | 34 | 42 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 19 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 3 | 3 | 2 U | 2 U | 2 U | 4 | 2 U | 31 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 235 | 14 U | 704 | 72 | 595 | 40 | 688 | 37 | 422 | 14 U |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 5 | Grid Point 1 | | Grid Point 2 | Grid Point 3 | | Grid Point 4 | | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-212 | ESV-SB-205 | ESV-SD-213 | ESV-SD-214 | ESV-SB-215 | ESV-SD-236 | ESV-SB-236 | ESV-SD-228 Fence | ESV-SD-254 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 10 Feet | 10 Feet | 31 Feet | 31 Feet | 49 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 12 Inches | 0 Inches | 12 Inches | 0 Inches | 0 Inches |
| Chromium | 686 | 300 | 248 | 814 | 394 | 799 | 179 | 933 | 178 U |
| Manganese | 1,004 | 580 | 409 U | 1,066 | 663 | 1,064 | 654 | 1,193 | 418 |
| Iron | 46,026 | 21,702 | 19,204 | 44,507 | 26,466 | 45,278 | 21,076 | 50,115 | 14,731 |
| Cobalt | 639 | 276 | 322 | 450 | 344 | 576 | 262 | 546 | 203 |
| Nickel | 775 | 155 | 162 | 812 | 292 | 727 | 136 | 878 | 33 |
| Copper | 51 | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 231 | 80 | 62 | 189 | 111 | 214 | 51 | 1,147 | 30 U |
| Arsenic | 41 U | 33 U | 33 U | 52 U | 33 U | 79 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 3 | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 414 | 83 | 158 | 518 | 241 | 792 | 36 | 267 | 19 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 6 | Grid Point 1 | | Grid Point 2 | Grid Point 3 | Grid Point 4 | | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-215 | ESV-SB-206 | ESV-SD-216 | ESV-SD-217 | ESV-SD-237 | ESV-SB-237 | ESV-SD-229 Fence | ESV-SD-255 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 10 Feet | 31 Feet | 31 Feet | 49 Feet | 77 Feet |
| Depth BGS: | 0 inches | 12 Inches | 0 Inches | 0 Inches | 0 Inches | 12 Inches | 0 Inches | 0 Inches |
| Chromium | 287 | 475 | 511 | 584 | 880 | 178 U | 178 U | 178 U |
| Manganese | 692 | 736 | 816 | 1,087 | 1,084 | 681 | 542 | 529 |
| Iron | 31,525 | 28,756 | 35,963 | 43,691 | 45,467 | 25,359 | 19,287 | 12,971 |
| Cobalt | 364 | 318 | 305 | 355 | 588 | 366 | 240 | 174 U |
| Nickel | 377 | 349 | 602 | 880 | 778 | 170 | 232 | 26 U |
| Copper | 82 | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 486 | 100 | 102 | 91 | 174 | 52 | 1,102 | 30 U |
| Arsenic | 51 U | 33 U | 37 U | 33 U | 54 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 515 | 119 | 370 | 307 | 544 | 37 | 136 | 265 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 7 | Grid Point 1 | | Grid Point 2 | Grid Point 3 | Grid Point 4 | Grid Point 5 | Gid Point 6 |
|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-218 | ESV-SB-207 | ESV-SD-219 | ESV-SD-220 | ESV-SD-238 | ESV-SD-230 Fence | ESV-SD-256 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 10 Feet | 31 Feet | 46 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 0 Inches | 0 Inches | 0 Inches |
| Chromium | 601 | 291 | 567 | 764 | 797 | 819 | 204 |
| Manganese | 1,196 | 720 | 1,319 | 1,088 | 1,111 | 1,131 | 427 |
| Iron | 47,839 | 27,843 | 48,234 | 46,791 | 44,427 | 51,194 | 11,190 |
| cobalt | 502 | 350 | 685 | 515 | 859 | 450 | 178 |
| Nickel | 828 | 263 | 834 | 851 | 727 | 796 | 26 U |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 118 | 35 | 69 | 61 | 172 | 886 | 44 |
| Arsenic | 39 U | 33 U | 33 U | 33 U | 37 U | 42 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 3 | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 391 | 50 | 152 | 99 | 372 | 417 | 194 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| RADIAL LINE 8 | Grid Point 1 | | Grid Point 2 | Grid Point 3 | Grid Point 4 | | Grid Point 5 | Grid Point 6 |
|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-221 | ESV-SB-208 | ESV-SD-222 | ESV-SD-223 | ESV-SD-239 | ESV-SB-239 | ESV-SD-231 Fence | ESV-SD-257 |
| Distance: | 0 Feet | 0 Feet | 5 Feet | 10 Feet | 29 Feet | 29 Feet | 49 Feet | 77 Feet |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 0 Inches | 12 Inches | 0 Inches | 0 Inches |
| Chromium | 201 | 178 U | 877 | 785 | 464 | 517 | 566 | 267 |
| Manganese | 637 | 785 | 1,002 | 893 | 980 | 523 | 1,240 | 409 U |
| Iron | 29,772 | 28,909 | 46,947 | 42,836 | 38,264 | 17,306 | 45,078 | 3,075 |
| Cobalt | 283 | 235 | 723 | 657 | 411 | 174 U | 310 | 174 U |
| Nickel | 283 | 219 | 806 | 681 | 584 | 26 U | 806 | 26 U |
| Copper | 78 | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 276 | 171 | 157 | 115 | 162 | 506 | 136 | 145 |
| Arsenic | 56 U | 33 U | 33 U | 33 U | 52 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 14 | 4 | 2 U | 2 U | 2 U | 3 | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 556 | 286 | 198 | 199 | 521 | 17 | 217 | 321 |

Key at end of table.

## Table 3-2

## EXPANDED SITE INVESTIGATION LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| VORTAC UST | Fill Pipe | | South Side | | Vent Pipe | | North Side | |
|---|---|---|---|---|---|---|---|---|
| Sample ID (ANN94)- | ESV-SD-240 | ESV-SB-240 | ESV-SD-241 | ESV-SB-241 | ESV-SD-242 | ESV-SB-242 | ESV-SD-243 | ESV-SB-243 |
| Depth BGS: | 0 Inches | 12 Inches | 0 Inches | 0 Inches | 0 Inches | 0 Inches | 0 Inches | 12 Inches |
| Chromium | 861 | 609 | 593 | 599 | 453 | 535 | 632 | 272 |
| Manganese | 1,209 | 1,139 | 1,049 | 966 | 1,060 | 875 | 1,085 | 859 |
| Iron | 47,979 | 48,038 | 46,616 | 44,448 | 41,933 | 38,640 | 44,653 | 39,298 |
| Cobalt | 644 | 536 | 426 | 487 | 427 | 298 | 450 | 492 |
| Nickel | 773 | 782 | 769 | 772 | 559 | 482 | 703 | 543 |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 147 | 129 | 138 | 117 | 340 | 264 | 541 | 81 |
| Arsenic | 43 U | 38 U | 33 U | 33 U | 42 U | 33 U | 35 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 426 | 378 | 166 | 167 | 424 | 306 | 348 | 81 |

Key:

BGS = Below ground surface.
mg/kg = Milligrams per kilogram.
U = Element was undetected. Reported result is the instrument detection limit.

**Table 3-3**

**ESI SOIL SAMPLES**
**POSITIVELY IDENTIFIED PETROLEUM COMPOUNDS AND TOTAL LEAD**
**LEVEL III ANALYSIS**
**VORTAC FACILITY**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**
**(mg/kg)**

| Sample ID | Parameters | | | |
|---|---|---|---|---|
| | Lead | DRO | VPH-G | TRPH |
| ANN94ESV-SD-400 | 610 | 180 J | ND | 230 |
| ANN94ESV-SB-400 | 580 | 220 J | ND | 69 |
| ANN94ESV-SD-401 | 1,200 | 11 | ND | 110 |
| ANN94ESV-SB-401 | 200 | 6.3 | ND | 100 |
| ANN94ESV-SD-402 | 510 | 100 J | 5.5 | 120 |
| ANN94ESV-SB-402 | 460 | 19 | ND | 66 |
| ANN94ESV-SD-403 | 260 | 17 | ND | ND |
| ANN94ESV-SB-403 | 440 | 15 | ND | ND |
| ANN94ESV-SD-404 | 1,100 | NA | NA | NA |
| ANN94ESV-SB-404 | 86 | NA | NA | NA |
| ANN94ESV-SD-405 | 150 | NA | NA | NA |
| ANN94ESV-SD-406 | 500 | NA | NA | NA |
| ANN94ESV-SD-407 | 160 | NA | NA | NA |
| ANN94ESV-SD-408 | 15 | NA | NA | NA |
| ANN94ESV-SD-409 | 14 | NA | NA | NA |
| ANN94ESV-SD-410 | 200 | NA | NA | NA |
| ANN94ESV-SD-411 | 160 | NA | NA | NA |
| ANN94ESV-SD-412 | 520 | NA | NA | NA |
| ANN94ESV-SD-413 | 4,100 | NA | NA | NA |
| ANN94ESV-SB-413 | 300 | NA | NA | NA |
| ANN94ESV-SD-414 | 1,500 | NA | NA | NA |
| ANN94ESV-SB-414 | 110 | NA | NA | NA |

Key at end of table.

Key:

DRO = Diesel-range organic.
FAA = Federal Aviation Administration, Alaskan Region.
ID = Identification.
J = Estimated.
mg/kg = Milligrams per kilogram.
NA = Not analyzed.
ND = Not detected.
SB = Subsurface soil.
SD = Soil.
TRPH = Total recoverable petroleum hydrocarbons.
VORTAC = Very High Frequency Omnirange Station/Tactical Air Navigation.
VPH-G = Volatile petroleum hydrocarbons as gasoline.

**Table 3-4**

**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
LEVEL IV ANALYSIS
VORTAC FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

| Sample Number (ANN94-): | ESV-SD-100 | ESV-SB-100 | ESV-SD-101 | ESV-SE-100 | ESV-SE-101 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | 5,030 | 4,330 | 4,330 | 1,020 | 2,580 |
| Arsenic | 11.5 | 1.4 | 10.6 | ND | ND |
| Barium | 45.0 | 39.4 | 19.4 | 3.4 | 10.8 |
| Beryllium | 0.11 | 0.12 | 0.12 | 0.09 | 0.12 |
| Calcium | 4,730 J | 1,060 J | 1,370 J | 4,650 | 832 |
| Chromium | 64.2 | 25.5 | 71.8 | 2.3 | 2.6 |
| Cobalt | 51.7 | 28.2 | 68.1 | ND | ND |
| Copper | 98.6 J | 23.3 J | 125 J | 1.5 | 4.0 |
| Iron | 28,800 | 18,300 | 36,400 | 940 J | 3,130 J |
| Lead | 1,170 J | 0.60 J | 2,260 | 10.9 J | 4.5 J |
| Magnesium | 84,800 | 47,100 | 119,000 | 1,070 | 1,390 |
| Manganese | 531 | 307 | 647 | 26.9 | 42.0 |
| Mercury | 0.35 | ND | 0.53 | ND | ND |
| Nickel | 353 | 194 | 507 | ND | ND |
| Potassium | 956 | 797 | 323 | ND | ND |
| Sodium | 51.3 | ND | ND | ND | ND |
| Vanadium | 17.4 | 18.8 | 16.1 | 3.7 | 7.1 |
| Zinc | 477 J | 166 J | 706 J | ND | 23.3 |

Key at end of table.
recycled paper

**Table 3-4**

**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
LEVEL IV ANALYSIS
VORTAC FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

| Sample Number (ANN94-): | ESV-SE-102 | ESV-SE-103 | ESV-SE-104 | ESV-SE-105 | ESV-SE-106 |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | 11,200 | 1,800 | 2,690 | 564 | 4,780 |
| Arsenic | 1.1 | ND | ND | ND | 4.8 |
| Barium | 29.6 | 5.2 | 12.8 | 10.1 | 22.7 |
| Beryllium | 0.23 | ND | ND | ND | 0.10 |
| Calcium | 1,620 | 307 | 725 | 660 | 2,060 |
| Chromium | 6.3 | ND | 3.1 | ND | 37.5 |
| Cobalt | 4.6 | ND | ND | ND | 21.3 |
| Copper | 7.0 | ND | 3.8 | 2.6 | 9.0 |
| Iron | 7,160 J | 602 J | 4,430 J | 3,130 J | 21,500 J |
| Lead | 2.7 J | 18.0 J | 4.8 J | 1.6 J | 5.1 J |
| Magnesium | 2,900 | 148 | 1,030 | 421 | 44,400 |
| Manganese | 82.6 | 43 | 47.4 | 12.6 | 266 |
| Mercury | ND | ND | ND | ND | ND |
| Nickel | 3.5 | ND | 4.4 | ND | 151 |
| Potassium | ND | ND | ND | ND | ND |
| Sodium | 53.5 | ND | ND | ND | 1,380 |
| Vanadium | 26.1 | ND | 7.4 | ND | 16.8 |
| Zinc | ND | 30.2 | ND | ND | 88.6 |

Key at end of table.

**Table 3-4**

**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
LEVEL IV ANALYSIS
VORTAC FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

| Sample Number (ANN94-): | ESV-SD-412* | ESV-SD-413* | ESV-SB-413* | ESV-SD-414* | ESV-SB-414* |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Aluminum | NA | NA | NA | NA | NA |
| Arsenic | NA | NA | NA | NA | NA |
| Barium | NA | NA | NA | NA | NA |
| Beryllium | NA | NA | NA | NA | NA |
| Calcium | NA | NA | NA | NA | NA |
| Chromium | NA | NA | NA | NA | NA |
| Cobalt | NA | NA | NA | NA | NA |
| Copper | NA | NA | NA | NA | NA |
| Iron | NA | NA | NA | NA | NA |
| Lead | 349 J | 6,020 J | 467 J | 1,420 J | 69.3 J |
| Magnesium | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA |
| Mercury | NA | NA | NA | NA | NA |
| Nickel | NA | NA | NA | NA | NA |
| Potassium | NA | NA | NA | NA | NA |
| Sodium | NA | NA | NA | NA | NA |
| Vanadium | NA | NA | NA | NA | NA |
| Zinc | NA | NA | NA | NA | NA |

Key:

J = Estimated concentration.
mg/kg = Milligrams per kilogram.
NA = Not analyzed.
ND = Not detected.
SD = Soil sample.
SE = Sediment sample.
* = Lead only reanalysis.

## Table 3-5

## EXPANDED SITE INVESTIGATION SOIL AND SEDIMENT SAMPLES POSITIVELY IDENTIFIED ORGANIC COMPOUNDS, LEVEL IV ANALYSIS VORTAC FACILITY ANNETTE ISLAND FAA STATION ANNETTE ISLAND, ALASKA ($\mu$g/kg)

| Sample Number (ANN94-): | ESV-SD-100 | ESV-SB-100 | ESV-SD-101 | ESV-SE-100 | ESV-SE-101 | ESV-SE-102 | ESV-SE-103 | ESV-SE-104 | ESV-SE-105 | ESV-SE-106 |
|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | | | |
| Chloroform | ND | ND | ND | ND | ND | ND | 3 | ND | ND | ND |
| Toluene | 110 | 3 | 49 | ND | 2 | ND | 4 | ND | 27 | ND |
| **BNA** | | | | | | | | | | |
| Diethylphthalate | ND | ND | ND | 2,300 | 1,100 | ND | ND | ND | ND | ND |

Key:

BNA = Base neutral/acid extractable organic compound.
ND = Not detected.
SB = Subsurface soil sample.
SD = Soil sample.
SE = Sediment sample.
VOC = Volatile organic compounds.

## Table 3-6

## ESI SOIL SAMPLES
## POSITIVELY IDENTIFIED TCLP METALS
## LEVEL IV ANALYSIS
## VORTAC FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## (mg/L)

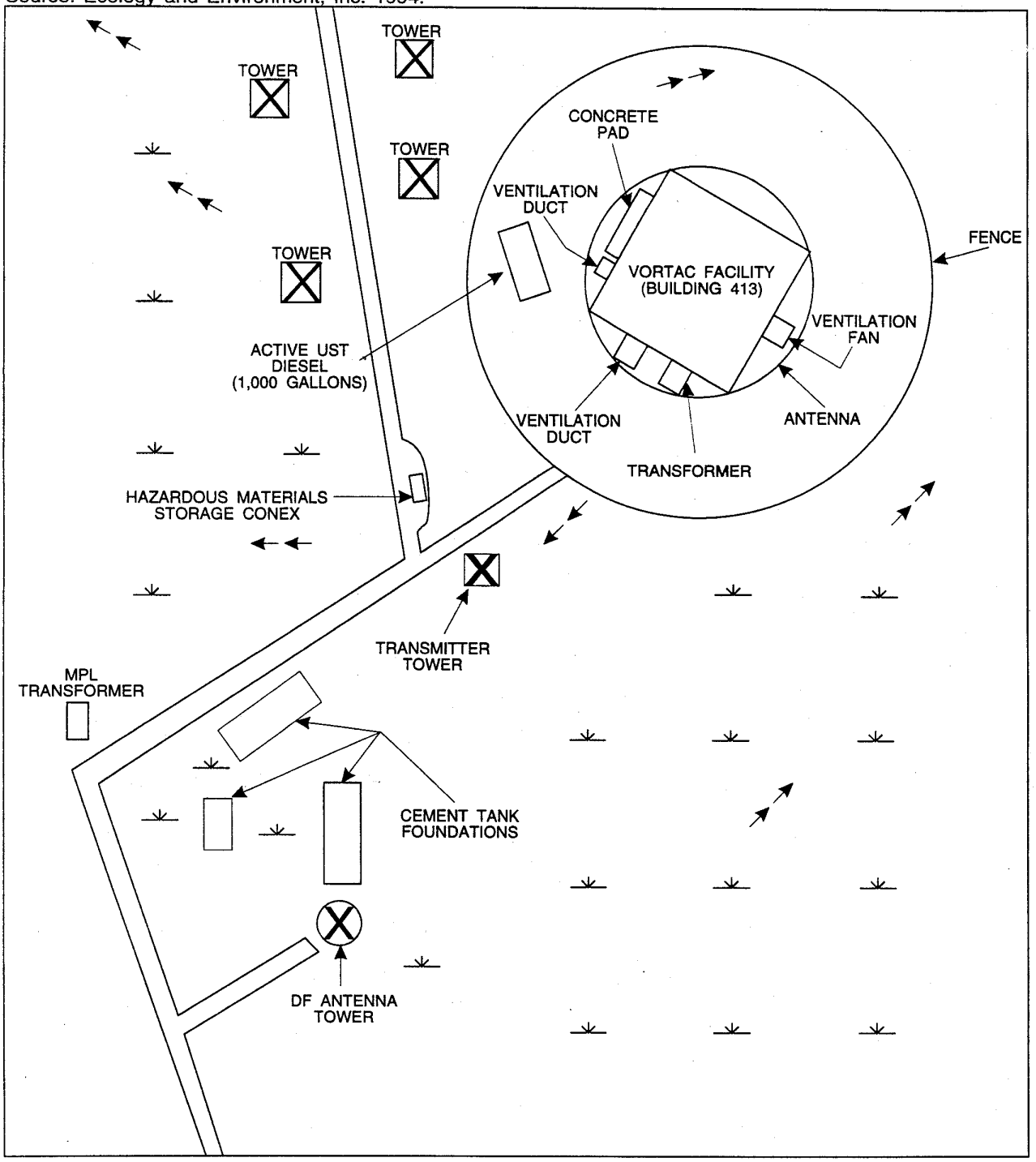
| Sample Number (ANN94-): | ESV-SD-100 | ESV-SB-100 | ESV-SD-101 | ESV-SD-412 | ESV-SD-413 | ESV-SB-413 | ESV-SD-414 | ESV-SB-414 | Regulatory Level |
|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | |
| Barium | 0.49 | 0.42 | 0.47 | NA | NA | NA | NA | NA | 100.0 |
| Cadmium | 0.12 | ND | 0.0091 | NA | NA | NA | NA | NA | 1.0 |
| Lead | 5.7 | 0.87 | 11.1 | ND | 65.2 | 5.2 | 8.1 | 0.28 | 5.0 |

Key:

mg/L = Milligrams per liter.
NA = Not analyzed.
ND = Not detected at quantitation limits noted in parenthesis.
SB = Subsurface soil.
SD = Soil sample.

VS101031.CDR

Source: Ecology and Environment, Inc. 1994.




SOURCE: Field observation

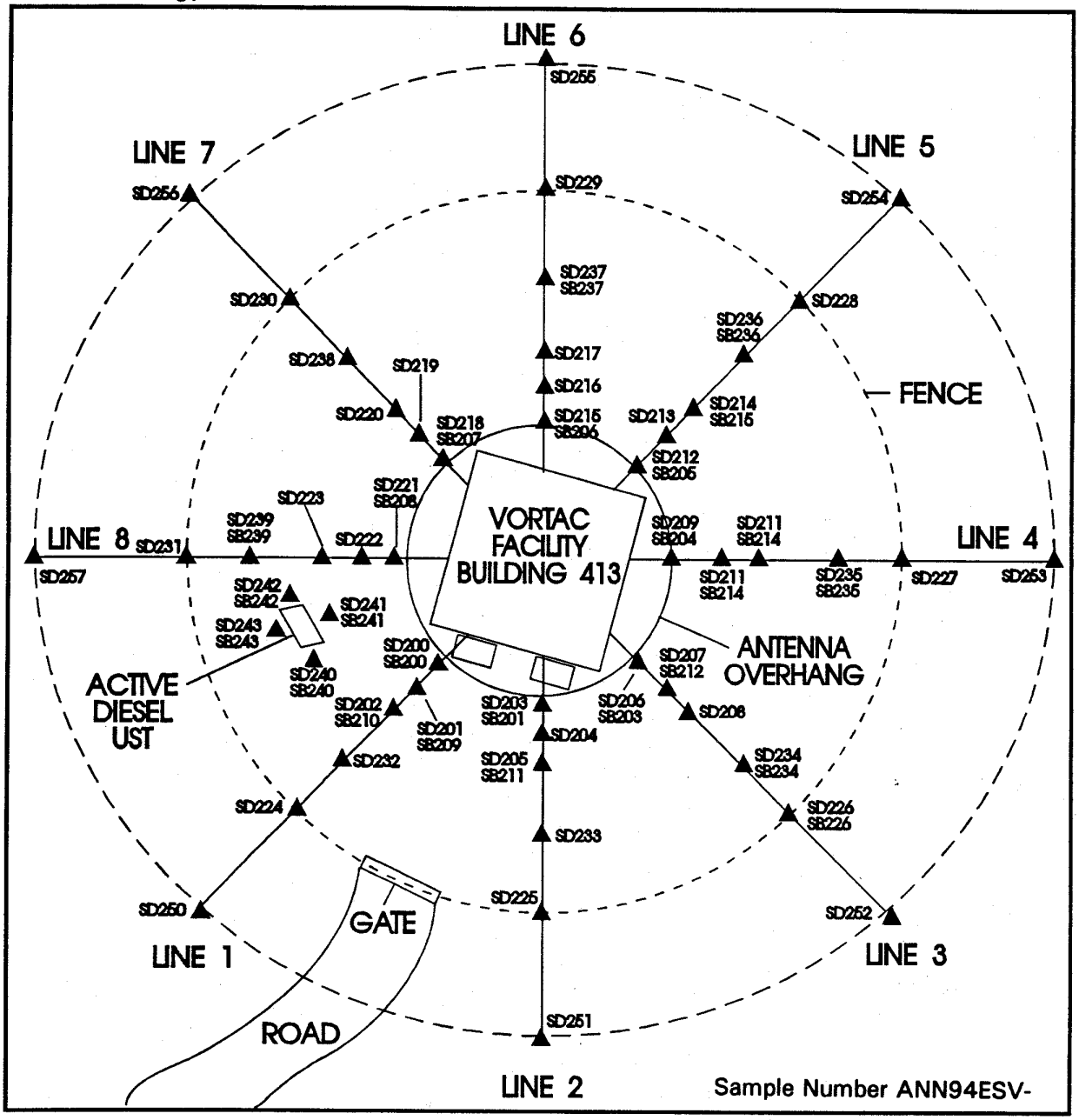
| KEY |
|---|
| Marsh |
| Direction of Surface Water Drainage |
| NOTE: Buildings Not To Scale |

N

Approximate Scale In Feet
0 15 30

| Ecology and Environment, Inc. | |
|---|---|
| Figure: 3-1 | Proj. No.: VS1000 |
| Date: 5-25-94 | Drawn By: JAL |
| Title: Annette Island FAA Station VORTAC/DF Facility Site Map | |

**Source:** Ecology and Environment, Inc. 1994




| Key: |
|---|
| SD = composite surface soil sample |
| SB = grab soil sample at 1 foot BGS |
| ▲ = Sample location |

N

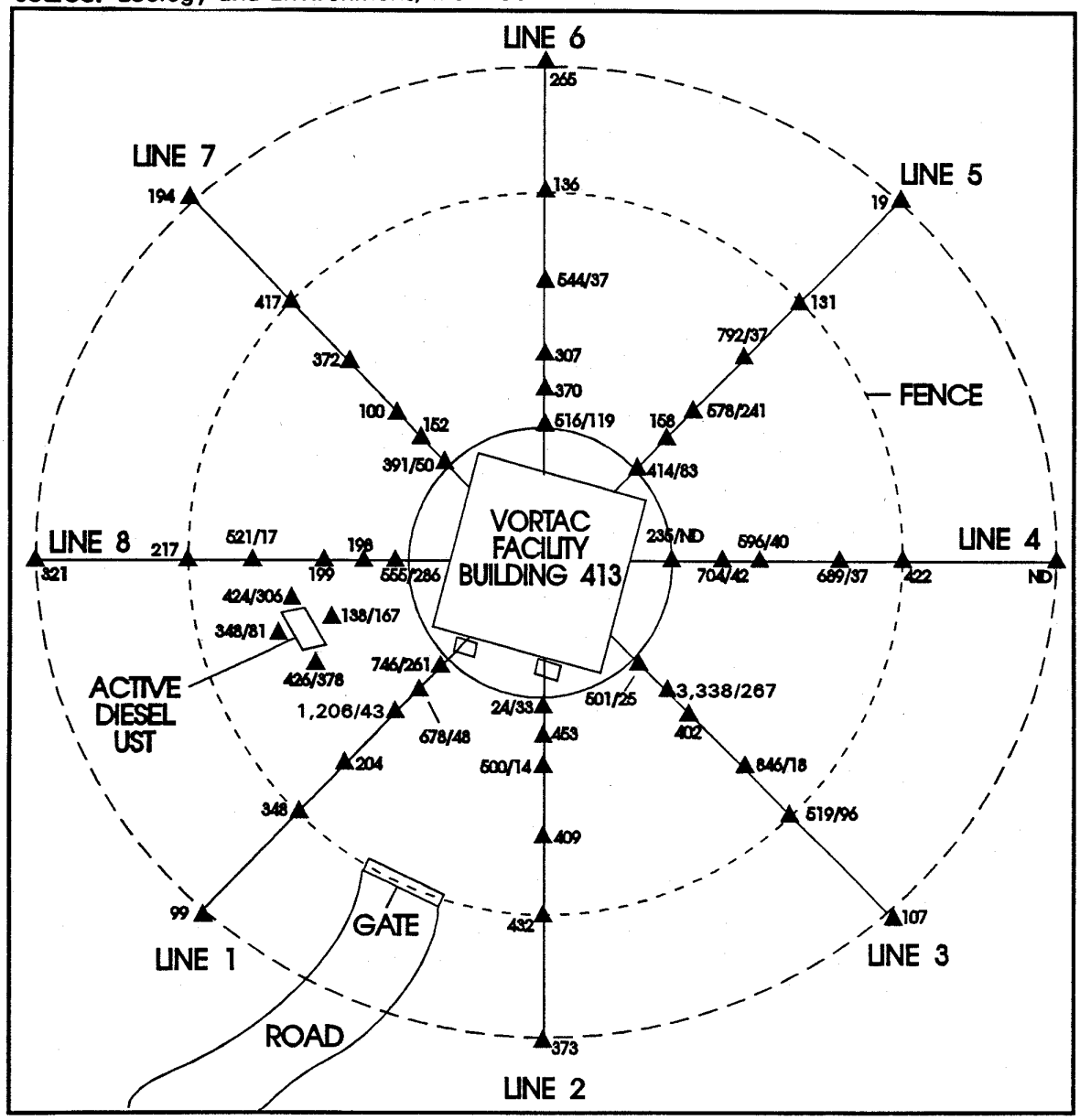
0 40 80

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 3 - 2 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |

Title: Annette Island FAA Station ESI
VORTAC Facility Level II XRF Screening
Sample Loaction Map
June 1994

**Source:** Ecology and Environment, Inc. 1994




| KEY: |
|---|
| 500/14 = surface/ 1 foot BGS<br>ND = not detected |

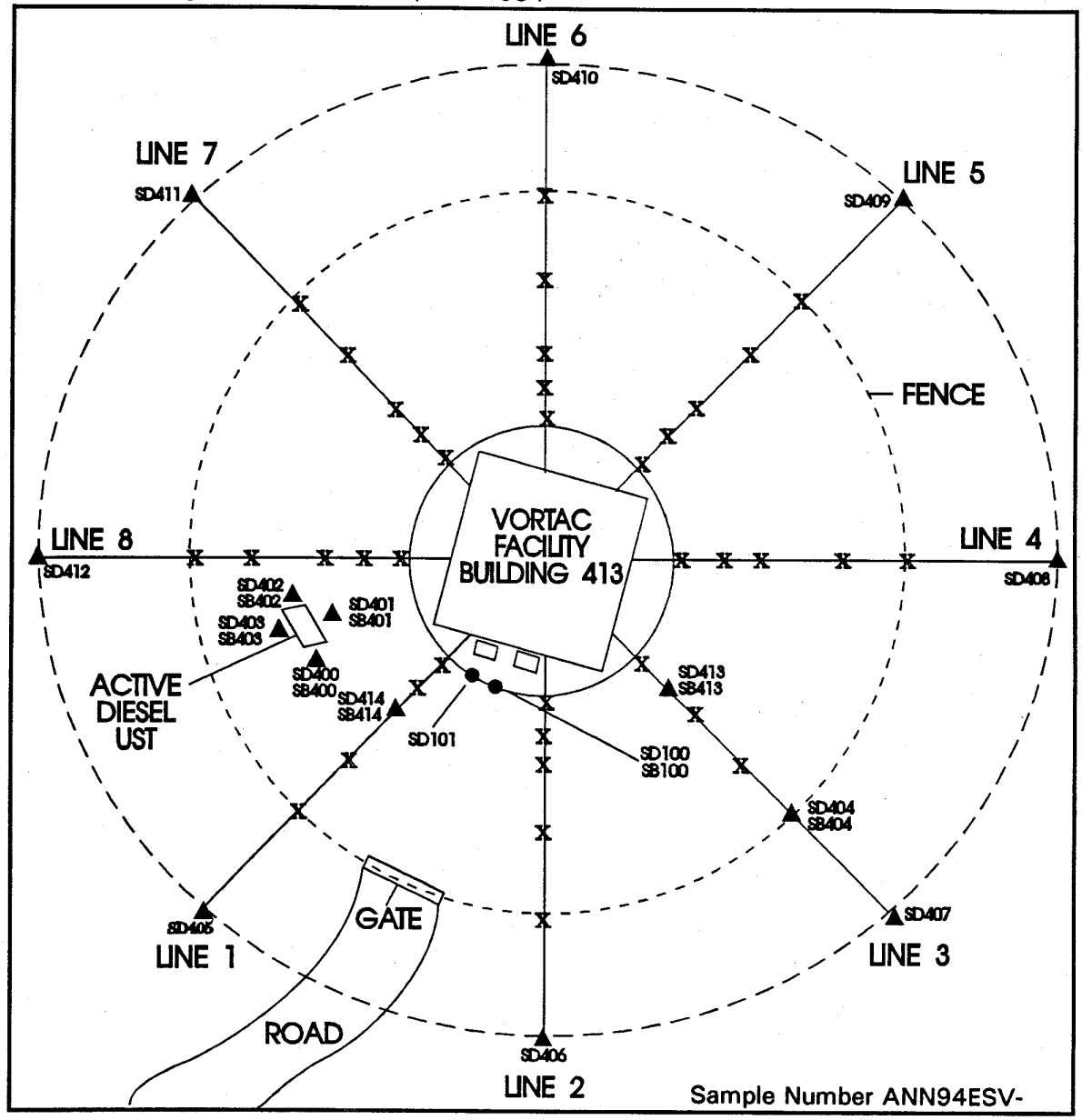
N

0 40 80

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 3 - 3 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |
| Title: Annette Island FAA Station ESI<br>VORTAC Facility Level II XRF Screening<br>Lead Results Map (mg/kg)<br>JUNE 1994 | |

Source: Ecology and Environment, Inc. 1994




| Key: |
|---|
| ▲ = level III samples |
| ● = level IV samples |
| SD = composite surface soil sample |
| SB = grab soil sample at 1 foot BGS |

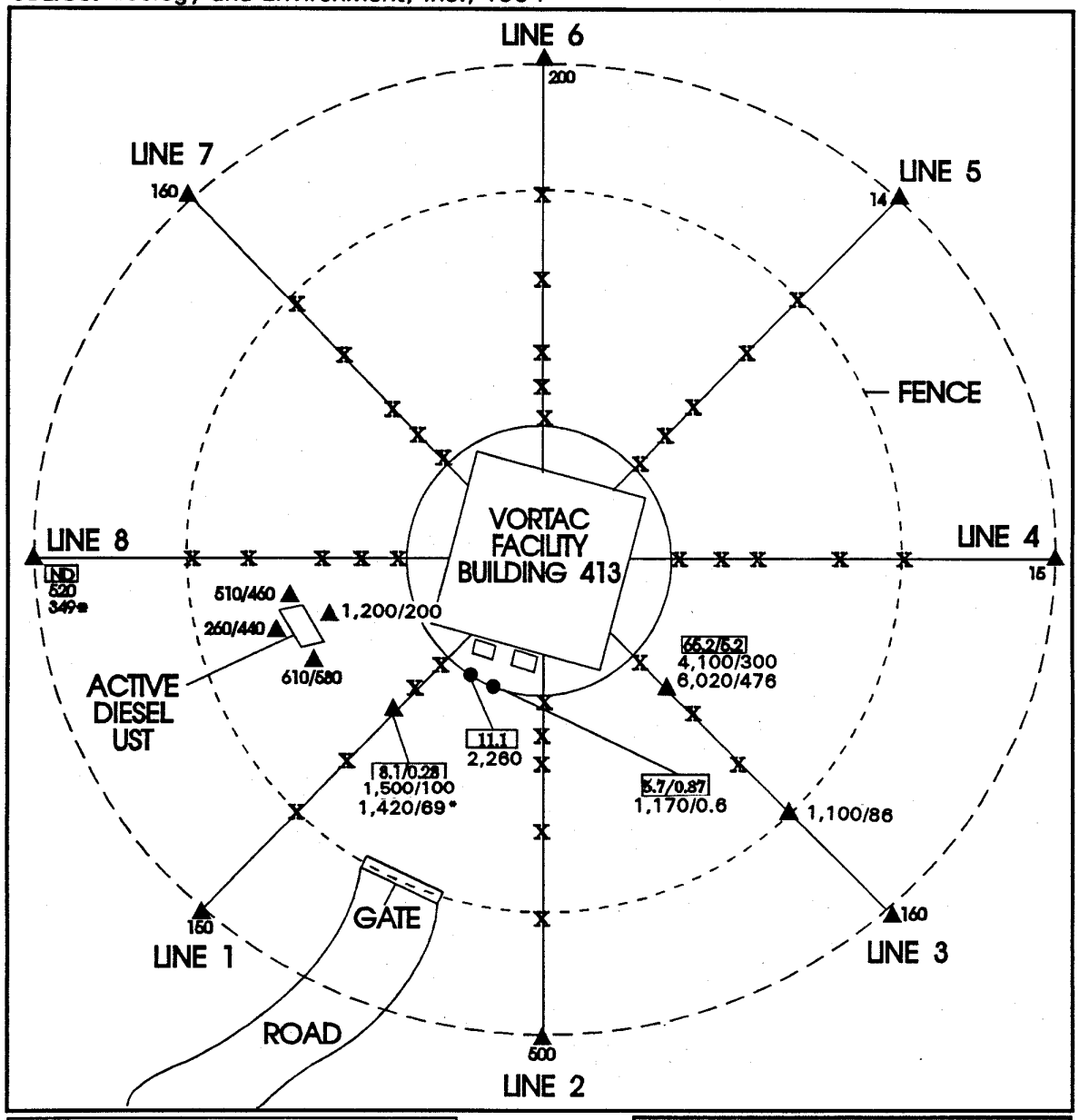
N

0 40 80

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 3 - 4 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |
| Title: Annette Island FAA Station ESI Vortac Facility Level III & IV Sample Location Map June 1994 | |

Source: Ecology and Environment, Inc., 1994




| Key: |
|---|
| 1500/110 = surface/ 1 foot BGS (mg/kg) |
| ● = Level IV sample location |
| 11.1 = TCLP result (mg/l) |
| ▲ = Level III sample location |
| * = TAL lead reanalysis |
| ND = not detected |

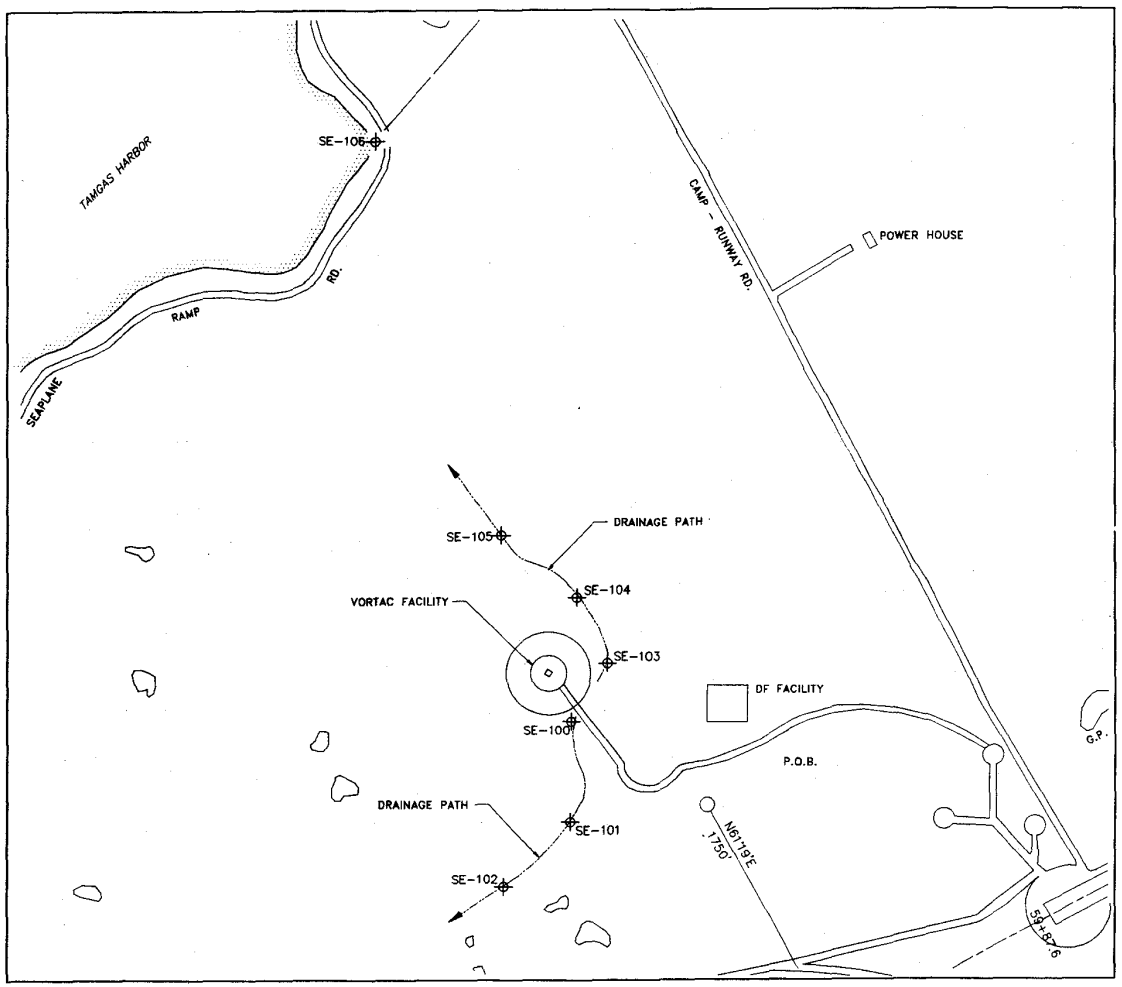
N

0 40 80

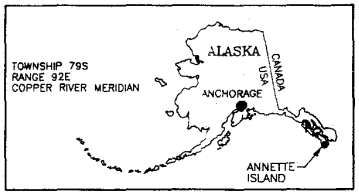
SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 3 - 5 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |
| Title: Annette Island FAA Station ESI<br>Vortac Facility Level III & IV<br>TAL and TCLP Lead Results Map<br>June 1994 | |

Source: AED - ANN - 020.003




LOCATION MAP




LEGEND

SHORES

SE-103 SAMPLE LOCATIONS (ANN94ESV- )

SURFACE WATER FLOW

N

APPROXIMATE SCALE IN FEET

0 500 1000 1500 2000

| Ecology and Environment Inc. | |
|---|---|
| Figure: 3-6 | Proj. No: VR1000 |
| Date: 9/08/94 | Drawn by: EGM |
| Title: ANNETTE ISLAND FAA STATION VORTAC FACILITY OVERLAND SURFACE WATER PATHWAY SAMPLE LOCATION MAP | |

# 4. NONDIRECTIONAL BEACON/H-MARKER FACILITY

## 4.1 LOCATION AND DESCRIPTION

The NDB/H-marker facility is an active facility located approximately 1.5 miles northwest of the north end of the runway on 10 leased acres (see Figure 1-2). The former NDB/H-marker building was burned completely in the early 1980s and all that remains is a 500-square-foot foundation. After the building burned, the debris was bulldozed off of the foundation mostly to the south and west sides. During the ECI, ash and burned material could be seen mixed with soil around the perimeter of the foundation. Building 407, a small fiberglass Grassis building, was subsequently placed on the foundation. This building now houses active electronics equipment used to operate the NDB. A fenced antenna tower and live transformer, constructed on a built-up gravel pad, were located immediately to the east of the foundation. A live transformer owned by Metlakatla Power and Light is located next to the road, directly west of the NDB/H-marker building. A gravel service road leads from the main road past the weather bureau living quarters, which is the access point for the RCAG facility, to the NDB/H-marker facility. A gate across the service road is located just beyond the weather bureau housing area, approximately 0.3 mile from the NDB/H-marker facility (see Figure 4-1). The gate is usually not locked and the area beyond the gate, including the NDB/H-marker facility area, can be accessed at all times. The road is used by local residents to access the coastal area at Smuggler Cove.

The property surrounding the NDB/H-marker facility is mostly composed of marsh and muskeg. A small pond is located immediately south of the concrete foundation. A small stream flows west from the pond beneath the road and drains into a marsh area west of the road. See Section 4.2.6 for further discussion of the habitat in the area.

An ECI conducted in August 1991 (E & E 1992b) identified the presence of lead in soil samples collected on the west side of the concrete foundation and on the west side of the

fenced tower. The lead concentration at both of these locations exceeded MSEC. Additionally, contaminants in the TAL metal fraction and the dioxin/furan fraction exceeded three times background concentrations. Both of these areas were targeted for further investigation in the ESI as stated in the FAA SOW dated September 29, 1993.

## 4.2 EXPANDED SITE INVESTIGATION

### 4.2.1 Level II Soil Grid Sampling

To determine the extent of lead contamination around the concrete foundation, a grid sampling array was developed to cover the area where burned debris and ash were visible and contamination was suspected. Surface soil samples were initially collected at evenly spaced 5-foot intervals around the foundation. A second tier of samples were collected at a distance of 5-feet from the initial sample grid. The sample location and corresponding sample number for all surface and subsurface soil samples are shown on Figure 4-2. Table 4-1 summarizes the samples collected. The samples were analyzed for lead using a field portable XRF. XRF analytical protocol is presented in Appendix F. Where elevated lead levels in excess of 500 mg/kg were found, a subsurface sample was collected 12-inches beneath the surface sample. A contingency was established in the ESI work plan to collect samples at a deeper 24-inch contour if lead concentrations exceeded 500 mg/kg in the 12-inch subsurface samples, this occurred at three sample locations: ANN94ESN-SB-215 (northwest corner), ANN94ESN-SB-230 (southeast corner); and ANN94ESN-SB-232 (southwest corner).

The results of XRF lead analysis for all sample locations are presented in Table 4-2 and in Figure 4-3. Up to three values are presented on Figure 4-3 as SD/SB/SC for each sample corresponding to the surface (SD), subsurface at 12-inch depth (SB) and subsurface at a 24-inch depth (SC). The distribution of lead concentration in surface and sub-surface soil was variable throughout the study area. Concentrations greater than 500 mg/kg were found primarily on the south and west sides, where a majority of the burned debris was observed. Lead levels greater than 500 mg/kg were also found in one sample on each of the north and east sides of the foundation. Lead was less than 300 mg/kg on the west side of the NDB/H-marker transmitter tower.

### 4.2.2 Level III Lead Sampling

Selected surface and subsurface Level II samples were submitted for Level III confirmation analysis of lead. A sample summary is presented in Table 4-1 and sample

locations are shown on Figure 4-4. The results of the Level III lead analysis are presented by location on Figure 4-5 and in Table 4-3. Level III total lead results did not correlate with Level II XRF or Level IV lead results found at the same locations. The soils around the NDB/H-marker building foundation consist of gravel intermixed with ash and debris. This matrix nonhomogeneity is suspected to be the cause of poor lead correlation. For this reason, NDB/H-marker Level III confirmation samples were not included in the XRF/ASC lead correlation as described in Section 2.7.4.

### 4.2.3 Level IV Source and Target Sampling

Potential source and surface water pathways for lead and other contaminants present around the concrete foundation source area were assessed. Characterization of the source area using Level II and Level III analysis has been previously described. Level IV source samples were collected from lead contaminated areas that were identified during the ECI. The potential CERCLA source was characterized by submitting two surface and one shallow subsurface soil samples collected from the west side of the concrete foundation. Surface soil sample ANN94ESN-SD-101 was collected near the southwest corner of the building. Collocated surface (ANN94ESN-SD-100) and subsurface (ANN94ESN-SB-100) soil samples were collected near the northwest corner of the building. The sample locations are presented in Figure 4-4. All three samples were submitted for Level IV analysis for TAL metals and TCL parameters, including dioxin/furan parameters.

All the surface and subsurface source samples were found to contain the following concentrations of metals at greater than three times background concentrations: barium (145 mg/kg), chromium (47.1 mg/kg), lead (1,990 mg/kg), and zinc (345 mg/kg) in surface soil sample ANN94ESN-SD-100; arsenic (31.5 mg/kg), chromium (118 mg/kg), cobalt (73.6 mg/kg), copper (86.7 mg/kg), lead (1,040 mg/kg), magnesium (129,000 mg/kg), nickel (592 mg/kg), selenium (2.3 mg/kg), and zinc (701 mg/kg) in subsurface soil ANN94ESN-SB-100; and chromium (298 mg/kg) and lead (2,450 mg/kg) in surface soil ANN94ESN-SD-101. Inorganic analytical results are reported in Table 4-4. Total lead concentrations are reported on Figure 4-5. Lead exceeded the MSEC criteria of 400 mg/kg for all three of these source samples. In addition, the following dioxin isomers were found in these samples: OCDD (182 ng/kg), 1,2,3,4,6,7,8 HpCDF (4.86 ng/kg), total HpCDD (28.3 ng/kg), and HpCDF (5.60 ng/kg) in ANN94ESN-SD-100; 1,2,3,4,6,7,8-HpCDD (22.0 ng/kg), OCDD (85.4 ng/kg), 1,2,3,4,7,8-HxCDF (4.64 ng/kg), 1,2,3,4,6,7,8-HpCDF (6.75 ng/kg), total HpCDD (22.0

ng/kg), and total HpCDF (11.2 ng/kg) in sample ANN94ESN-SB-100; and OCDD (88.7 ng/kg) in ANN94ESN-SD-101. Dioxin analytical results are reported in Table 4-5. None of the samples exceeded the MSEC value of 1 part per billion (ppb) total equivalence factor (TEF) for dioxins. No other compounds were found to exceed three times background concentrations or MSEC criteria in these samples (see Section 4.2.4 for a complete discussion of the background samples).

In addition to these source samples, sample ANN94ESN-SD-402, which was originally a Level III sample, was submitted in September 1994 for reanalysis of Level IV TAL lead only. This reanalysis was performed at FAA's request concurrent with a TCLP metals analysis (see Section 4.2.5). This sample contained lead at 3,270 mg/kg which exceeded the lead MSEC of 400 mg/kg and exceeded three times background concentrations. Results are presented in Table 4-4 and on Figure 4-5.

The wetland adjacent to the NDB/H-marker facility was evaluated to determine whether it meets the criteria of a target wetland located in the surface water pathway according to the HRS model. One runoff pathway was identified, which extended from the pond and marsh located west of the facility northeast to Smuggler Cove (see Section 4.2.6 for a complete discussion of the pathways). Sediment samples were collected at the probable point of entry into the wetland, at approximately 0.1 mile and 0.2 mile from the probable point of entry, and at the beach at Smuggler Cove. The beach sample was collected from a surface beach area at the mean tide line.

Various compounds were found to be present in target sediment samples collected from the NDB/H-marker facility. Aluminum (7,270 mg/kg), barium (17.0 mg/kg), magnesium (4,890 mg/kg), manganese (62.8 mg/kg), nickel (22.5 mg/kg), and vanadium (12.8 mg/kg) were found to be present in peat sediment sample ANN94ESN-SE-100, which was collected at the wetland probable point of entry. All of these compounds were also found in source samples.

Barium was also found at greater than three times background concentrations in sandy stream sediment sample ANN94ESN-SE-102 (37.1 mg/kg), which was collected 0.2 mile downgradient of ANN94ESN-SE-100; and in beach sediment sample ANN94ESN-SE-103 (75.4 mg/kg), which was collected at the end of the drainage. In addition, sample ANN94ESN-SE-103 contained potassium (3,090 mg/kg) and diethylphthalate (1,400 mg/kg) at concentrations that exceeded three times background. Diethylphthalate was not found in source samples; therefore, it does not appear the NDB is the source of this compound. No

other compounds were found to exceed three times background concentrations or MSEC criteria in these samples. A sample summary is presented in Table 4-1 and sample results are presented in Tables 4-2 through 4-6.

### 4.2.4 Background Samples

Background samples were collected for each distinct sample matrix (soil, sediment, and beach sediment) sampled. The matrices encountered at the NDB/H-marker included soil/gravel, sandy sediment, peaty sediment, and beach sand. See sections 2.7.1 and 4.2.4 for a discussion of the background samples.

### 4.2.5 Level IV TCLP Sampling

Source samples ANN94ESN-SD-100, ANN94ESN-SB-100, and ANN94EN-SD-101 were also submitted for Level IV TCLP metals analysis. Sample ANN94ESN-SD-402 was submitted for Level IV TCLP lead-only analysis in September 1994 after the field work was completed and at the request of FAA. The results are presented in Table 4-7 and on Figure 4-5. This sample was also submitted for reanalysis of Level IV TAL lead-only concurrent with the TCLP analysis for comparison purposes. Sample ANN94ESN-SD-402 (14.3 mg/l) exceeded the TCLP regulatory limit for lead of 5.0 mg/l. No other sample results exceeded TCLP regulatory limits. Results are presented in Table 4-7 and on Figure 4-5.

### 4.2.6 Wetlands Survey

The primary objective of the wetland survey was to identify wetlands 0.2 mile down-gradient of the source. The wetland survey conforms to the definition provided in 40 CFR 230.41 See Section 3.2.1.3 for the definition of a wetland and for a discussion of Annette Island wetlands.

The NDB/H-marker was constructed on a gravel pad. The pad extended several feet in all directions beyond the remaining foundation. Drainage ditches extended from floor drains on the south end of the foundation. Surface runoff apparently followed the drainage ditches, crossed the road, and then traveled southwest to a low point. At this low point, the surface runoff intersected another drainage ditch. This drainage ditch subsequently emptied into a small channel, which drained into a series of ponds. This area represented the closest wetland along the drainage pathway from the NDB/H-marker and was chosen as the wetland point of entry. ANN94ESN-SE-100 was collected from this location. The overland surface

water pathway is shown in Figure 4-6. Vegetation in this area consisted of sitka alder (Alnus sitkensis), shore pine, yellow cedar, and sweet gale in the shrub layer. There was no tree stratum in this area. Horsetail, deer cabbage, fragile fern *(Cystopteris fragilis)*, jeffrey shooting star, skunk cabbage, labrador tea, bog laurel, crowberry, indian helleborne (*Veratrum viride*), and various sedges *(Carex spp.)* were in the herbaceous layer. The soil was peat overlying a muck and was saturated. Standing water was observed in the area.

South of ANN94ESN-SE-100 surface water channelized and then drained into a series of ponds. From the ponds, water drained to the west towards Clarence Strait. A drainage channel formed and entered a forested wetland that had upland incursions. The channel substrate varied from sandy soils to organic muck overlying sandy soils. The channel meandered through the wetland and disappeared approximately 100 feet from the beach. ANN94ESN-SE-101 and ANN94ESN-SE-102 were collected in the stream channel within the forested wetland at 0.1 mile and 0.2 mile downgradient of the wetland probable point of entry, respectively. The channel varied from one to two feet in depth and contained approximately 4 to 6 inches of water. The soils on the banks of the stream channel were organic peat and muck overlying sands. The channel substrate varied from organic material overlying sands and gravel, to a sand and gravel bottom.

The vegetation in the forested wetland consisted of yellow cedar, western redcedar, shore pine, and hemlock in the tree stratum. The shrub/shrub layer contains evergreen huckleberry, oval-leaf blueberry *(Vaccinium ovalifolium)*, fool's huckleberry, labrador tea, yellow cedar, and hemlock. The herbaceous layer contained skunk cabbage, deer cabbage, labrador tea, crowberry, dwarf dogwood, sphagnum moss, and grasses. The stream channel was lined with hydrophytic vegetation, which extended away from the channel. The areal extent of the hydrophytic vegetation depended on the slope of the land adjacent to the channel.

A spring trickled over exposed bedrock on the beach at the approximate location where the channel disappears. Vegetation ended abruptly at the highwater mark on the beach. ANN94ESN-SE-103 was collected on the beach below the high tide line within the spring area. The sample consisted of sands and gravel.

### 4.2.7 Site Specific Remedial Goals

As discussed previously in Section 2.8, MSECs were developed to screen the analytical results and to identify contaminants and areas that could have the potential to pose a significant risk of adverse human health effects. Lead was the only contaminant with a range

of concentration in soil at the NDB/H-marker that exceeded the conservative MSECs; therefore, it was the only one requiring a site-specific remedial goal.

The potentially exposed population consists of on-site workers and residents living on Annette Island. Information provided in the ECIR (E & E 1992b) indicated that the worker population consisted of 4 people who work periodically at each of the operating FAA facilities: the VORTAC/DF, NDB/H-marker, and RCAG. The typical work schedule involves maintenance personnel visiting each facility once per month and on an as-needed basis. It is estimated that the FAA workers spend less than 25% of their monthly work shift at the Annette Island facilities.

Residents living on the island consist of the people living in Metlakatla (630), which is located approximately 5 miles north of the FAA Station, and those living near the FAA facilities. It was estimated in the ECIR that 61 people live or work within 2-3 miles of the NDB/H-marker facility. The population living nearest to the FAA station were at the WBH area, located within 1/4 mile of the NDB/H-marker (Figure 4-1). At the time of the ECI, 15 people, including adults and children, were living in the WBH area.

Access to the contaminated soil at the NDB/H-marker is unrestricted. As discussed in Section 4.1, there was a gate on the access road between the WBH area and the NDB/H-marker, but it was not locked and local residents used the road to access coastal areas. Children living on Annette Island, primarily in Metlakatla and the WBH area, could gain access to the NDB/H-marker facility, although it is unlikely that they would spend much time in direct contact with the contaminated soil at the NDB/H-marker.

As discussed in Section 3.2.7, the IEUBK model, although not directly relevant to the adult population or the potential exposure situation on Annette Island, did provide a starting point for qualitative assessment of potential lead exposure. The recommended 400 mg/kg soil screening level was based on an average concentration for a potential exposure area. The average lead concentration at the NDB/H-marker was calculated based on both Level II screening and Level III confirmation data. The Level II samples were collected on a grid that characterized the entire source area, and as such were probably more representative of the area. A subset of these samples, which represented soil in the overland surface water pathway, were selected and submitted for Level III confirmation analysis. Unlike at the VORTAC/DF, the soil at the NDB/H-marker was not homogenous, and was composed of soil, gravel and an ash layer.

The average surface lead concentration in the biased Level III samples was 1392 mg/kg. The average of the Level II results was lower and, due to the non-homogeneous soil, was marginally correlated ($r = 0.79$) to the corresponding Level III values. The average Level II concentration was 524 mg/kg, which correlates to a 732 mg/kg Level III average (see Section 2.7.4.1 for a discussion of the correlation). Although young children could come into contact with contaminated soils in the NDB/H-marker area, exposure to those soils is unlikely to account for more than a small fraction of their total soil exposure, perhaps 5% to 10% at most. Since the 400 mg/kg screening level is considered adequately protective for young children when 100% of their exposure is to soils with that lead concentration, higher soil concentrations would be acceptable in an area like the NDB/H-marker area that is likely to contribute only a small fraction of an individual's total soil exposure. While the average soil lead concentration in the NDB/H-marker area may be as much as two to four times higher than the screening level, the fraction of exposure accounted for by that soil is probably at least 10 to 20 times lower than the 100% that formed the basis of the screening level. Therefore, the existing lead concentrations in the NDB/H-marker area soils appear to be adequately protective for young children because of the small contribution that area is likely to make to the children's total soil exposure.

The FAA employees who maintain the agency's facilities on Annette Island are the individuals likely to experience the greatest exposure to the NDB/H-marker area soils. The existing soil lead concentrations also appear to be adequately protective for these individuals because of their limited exposure to the soils and because of their lesser sensitivity to lead in soils as previously discussed in Section 3.2.7.

Since a review of the site conditions and potential exposures that might reasonably occur indicates that the existing soil lead concentrations appear to be acceptable for both young children, who are normally the group most sensitive to lead exposure, and facility worker who probably experience the greatest exposure, no site-specific remedial goal for lead in NDB/H-marker area soils on Annette Island appears to be needed.

### 4.2.8 Deviations From the Work Plan

All work at the NDB/H-marker facility was performed as specified in the ESI work plan except that surface water runoff pathway was thought to be the same for both the RCAG and the NDB/H-marker facilities. After inspecting the pathway, it was determined that they were separate and required three additional sediment samples and one additional beach sample

to characterize the pathway at the RCAG. See Section 5.2.4 for a discussion of the RCAG runoff pathway.

### 4.2.9 Conclusions and Recommendations

The issues of concern at the NDB/H-marker were the presence of contamination in soil, the exceedance of regulatory criteria and the potential for exposure to the contamination. The results of the investigation are summarized as follows:

- Lead contamination found in surface soil in the source area had a range of concentration which exceeded the MSEC. TCLP analysis indicated that the lead exceeded the 5.0 mg/L regulatory criteria. Approximately 150 cubic yards of soil are potentially affected at this facility, assuming contamination exists in the top 24 inches of soil across the site. Further action is recommended to address the lead contamination; and

- An assessment of the potential exposure to the lead contamination indicated that it did not pose a significant risk of adverse health effects. However, access to the lead contaminated soil is not restricted. Steps should be taken to contain the contaminated soil and to control access to it.

**Table 4-1**

**EXPANDED SITE INVESTIGATION SAMPLE SUMMARY**
**NDB/H-MARKER FACILITY**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESN-SD-100 | Surface soil | BNA, Dioxin, Pest/PCB, TAL metals, TCLP metals, VOC, XRF metals | ASC, Triangle/Level IV | Source sample—northwest side of building. |
| ESN-SB-100 | Subsurface soil | BNA, Dioxin, Pest/PCB, TAL metals, TCLP metals, VOC, XRF metals | ASC, Triangle/Level IV | Same location as ESN-SD-100 at 1 foot BGS. |
| ESN-SD-101 | Surface soil | BNA, Dioxin, Pest/PCB, TAL metals, TCLP metals, VOC, XRF metals | ASC, Triangle/Level IV | Source sample—southwest side of building. |
| ESN-SE-100 | Peaty sediment | BNA, Dioxin, Pest/PCB TAL metals, VOC | ASC, Triangle/Level IV | Entrance to wetland. |
| ESN-SE-101 | Sandy stream sediment | BNA, Dioxin, Pest/PCB TAL metals, VOC | ASC, Triangle/Level IV | Wetland 0.1 mile downgradient of ESN-SE-100 |
| ESN-SE-102 | Sandy stream sediment | BNA, Dioxin, Pest/PCB TAL metals, VOC | ASC, Triangle/Level IV | Wetland 0.2 mile downgradient of ESN-SE-100 |
| ESN-SE-103 | Sandy stream sediment | BNA, Dioxin, Pest/PCB TAL metals, VOC | ASC, Triangle/Level IV | Beach at end of drainage |
| ESN-SD-400 | Surface soil | Total lead | ASC/Level III | Same location as ESN-SD-100 |
| ESN-SB-400 | Subsurface soil | Total lead | ASC/Level III | Same location as ESN-SB-100 |
| ESN-SD-401 | Surface soil | Total lead | ASC/Level III | Same location as ESN-SD-101 |
| ESN-SD-402 | Surface soil | Total lead, TCLP lead, TAL lead | ASC/Level III,IV | Source sample—southwest side of building |
| ESN-SD-403 | Surface soil | Total lead | ASC/Level III | Source sample—north side of building |
| ESN-SB-404 | Subsurface soil | Total lead | ASC/Level III | Source sample—southwest corner of building |
| ESN-SB-405 | Subsurface soil | Total lead | ASC/Level III | Source sample—southeast side of building |
| ESN-SD-210 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-210 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |

Key at end of table.

## Table 4-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## NDB/H-MARKER FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESN-SD-211 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-211 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-212 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-212 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-213 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-213 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-214 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-214 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-215 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-215 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SC-215 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-216 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-216 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-217 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-217 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-218 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-218 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-219 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |

Key at end of table.

**Table 4-1**

**EXPANDED SITE INVESTIGATION SAMPLE SUMMARY**
**NDB/H-MARKER FACILITY**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESN-SB-219 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-220 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-220 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-221 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-221 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-222 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-222 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-223 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-223 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-224 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-224 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-225 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-226 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-226 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-227 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-227 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-230 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-230 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |

Key at end of table.

## Table 4-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## NDB/H-MARKER FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESN-SC-230 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-232 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-232 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SC-232 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SD-260 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |
| ESN-SB-260 | Soil | XRF metals | Field/Level II | See Figure 4-2 for locations |

Key:

ASC = Analytical Service Center.
BGS = Below ground surface.
BNA = Base neutral/acid extractable compounds.
BTEX = Benzene, toluene, ethylbenzene, and xylene.
DRO = Diesel-range organics.
Pest/PCB = Organochlorine pesticides/polychlorinated biphenyls.
SB = Soil at 1 foot BGS.
SC = Soil at 2 feet BGS.
SD = Surface soil.
SE = Sediment.
TAL metals = Target Analyte List metals.
TCLP = Toxicity characteristic leaching procedure.
VPH-G = Volatile petroleum hydrocarbons as gasoline.
XRF = X-ray fluorescence.

**Table 4-2**

**EXPANDED SITE INVESTIGATION
NDB/H-MARKER FACILITY
LEVEL II SOIL SAMPLES
XRF METALS RESULTS (mg/kg)
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
JUNE 1994**

| Sample ID (ANN94-): | ESN-SD-100 | ESN-SB-100 | ESN-SD-101 | ESN-SD-210 | ESN-SB-210 | ESN-SD-211 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 0 | 12 | 0 | 0 | 12 | 0 |
| Chromium | 784 | 825 | 515 | 426 | 256 | 476 |
| Manganese | 474 | 867 | 424 | 409 U | 409 U | 566 |
| Iron | 26,827 | 33,542 | 18,275 | 18,778 | 14,690 | 23,744 |
| Cobalt | 394 | 404 | 195 | 174 U | 174 U | 244 |
| Nickel | 420 | 507 | 58 | 58 | 77 | 151 |
| Copper | 49 U | 94 | 49 U | 49 U | 49 U | 53 |
| Zinc | 336 | 738 | 382 | 258 | 57 | 996 |
| Arsenic | 33 U | 50 U | 33 U | 176 U | 33 U | 160 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 4 | 4 | 2 U | 5 | 4 | 3 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 199 | 500 | 270 | 1,757 | 46 | 1,597 |

Key at end of table.

## Table 4-2

**EXPANDED SITE INVESTIGATION
NDB/H-MARKER FACILITY
LEVEL II SOIL SAMPLES
XRF METALS RESULTS (mg/kg)
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
JUNE 1994**

| Sample ID (ANN94-): | ESN-SB-211 | ESN-SD-212 | ESN-SB-212 | ESN-SD-213 | ESN-SB-213 | ESN-SD-214 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 12 | 0 | 0 | 12 | 0 | 12 |
| Chromium | 436 | 564 | 926 | 240 | 178 U | 412 |
| Manganese | 692 | 800 | 1,024 | 409 U | 409 U | 449 |
| Iron | 21,847 | 32,127 | 44,791 | 18,470 | 16,905 | 23,727 |
| Cobalt | 305 | 454 | 510 | 174 U | 186 | 233 |
| Nickel | 76 | 484 | 827 | 103 | 48 | 233 |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 113 | 669 | 216 | 122 | 111 | 72 |
| Arsenic | 33 U | 78 U | 33 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 4 | 3 | 2 U | 4 | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 254 | 778 | 112 | 130 | 71 | 62 |

Key at end of table.

**Table 4-2**

**EXPANDED SITE INVESTIGATION
NDB/H-MARKER FACILITY
LEVEL II SOIL SAMPLES
XRF METALS RESULTS (mg/kg)
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
JUNE 1994**

| Sample ID (ANN94-): | ESN-SB-214 | ESN-SD-215 | ESN-SB-215 | ESN-SC-215 | ESN-SD-216 | ESN-SB-216 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 12 | 0 | 12 | 24 | 0 | 12 |
| Chromium | 245 | 242 | 282 | 223 | 356 | 333 |
| Manganese | 527 | 481 | 511 | 660 | 756 | 609 |
| Iron | 25,510 | 17,148 | 25,060 | 23,182 | 28,404 | 25,075 |
| Cobalt | 205 | 174 U | 158 | 232 | 320 | 169 |
| Nickel | 175 | 160 | 187 | 75 | 212 | 335 |
| Copper | 49 U | 49 U | 49 U | 88 | 49 U | 49 U |
| Zinc | 186 | 95 | 416 | 367 | 163 | 253 |
| Arsenic | 33 U | 33 U | 91 U | 38 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 2 U | 3 | 5 | 2 U | 5 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 230 | 81 | 914 | 380 | 37 | 228 |

Key at end of table.

## Table 4-2

**EXPANDED SITE INVESTIGATION**
**NDB/H-MARKER FACILITY**
**LEVEL II SOIL SAMPLES**
**XRF METALS RESULTS (mg/kg)**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**
**JUNE 1994**

| Sample ID (ANN94-): | ESN-SD-217 | ESN-SB-217 | ESN-SD-218 | ESN-DB-218 | ESN-SD-219 | ESN-SB-219 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 0 | 12 | 0 | 12 | 0 | 12 |
| Chromium | 181 | 196 | 178 U | 203 | 195 | 178 U |
| Manganese | 581 | 409 U | 474 | 409 U | 672 | 409 U |
| Iron | 24,068 | 15,242 | 20,385 | 14,465 | 22,361 | 13,124 |
| Cobalt | 251 | 174 U | 174 U | 174 U | 215 | 174 U |
| Nickel | 57 | 84 | 241 | 64 | 90 | 110 |
| Copper | 49 U | 49 U | 404 | 49 U | 49 U | 49 U |
| Zinc | 132 | 78 | 2,463 | 95 | 373 | 131 |
| Arsenic | 33 U | 33 U | 404 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 3 | 9 | 2 U | 2 U | 4 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 54 | 38 | 4,045 | 52 | 243 | 96 |

Key at end of table.

**Table 4-2**

**EXPANDED SITE INVESTIGATION
NDB/H-MARKER FACILITY
LEVEL II SOIL SAMPLES
XRF METALS RESULTS (mg/kg)
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
JUNE 1994**

| Sample ID (ANN94-): | ESN-SD-220 | ESN-SB-220 | ESN-SD-221 | ESN-SB-221 | ESN-SD-222 | ESN-SB-222 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 0 | 12 | 0 | 12 | 0 | 12 |
| Chromium | 321 | 178 U | 501 | 483 | 186 | 228 |
| Manganese | 409 U | 658 | 409 U | 699 | 409 U | 501 |
| Iron | 19,176 | 24,447 | 20,233 | 24,294 | 20,007 | 22,183 |
| Cobalt | 174 U | 259 | 187 | 312 | 174 U | 177 |
| Nickel | 136 | 73 | 62 | 49 | 107 | 39 |
| Copper | 49 U | 49 U | 49 U | 49 U | 60 | 49 U |
| Zinc | 477 | 132 | 257 | 279 | 230 | 616 |
| Arsenic | 48 U | 33 U | 33 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 5 | 3 | 6 | 4 | 4 | 3 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 482 | 61 | 278 | 202 | 208 | 260 |

Key at end of table.

## Table 4-2

## EXPANDED SITE INVESTIGATION
## NDB/H-MARKER FACILITY
## LEVEL II SOIL SAMLES
## XRF METALS RESULTS (mg/kg)
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| Sample ID (ANN94-): | ESN-SD-223 | ESN-SB-223 | ESN-SD-224 | ESN-SB-224 | ESN-SD-225 | ESN-SD-226 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 0 | 12 | 0 | 12 | 0 | 0 |
| Chromium | 333 | 178 U | 384 | 372 | 336 | 304 |
| Manganese | 409 U | 409 U | 1,096 | 820 | 767 | 426 |
| Iron | 19,218 | 16,139 | 37,452 | 28,068 | 31,133 | 24,447 |
| Cobalt | 174 U | 188 | 306 | 158 | 385 | 174 U |
| Nickel | 87 | 59 | 389 | 157 | 371 | 26 U |
| Copper | 49 U | 49 U | 49 U | 49 U | 49 U | 49 U |
| Zinc | 170 | 81 | 99 | 81 | 126 | 161 |
| Arsenic | 33 U | 33 U | 33 U | 33 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 2 U | 3 | 4 | 3 | 2 U | 6 |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 127 | 15 | 90 | 35 | 74 | 174 |

Key at end of table.

**Table 4-2**

**EXPANDED SITE INVESTIGATION**
**NDB/H-MARKER FACILITY**
**LEVEL II SOIL SAMPLES**
**XRF METALS RESULTS (mg/kg)**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**
**JUNE 1994**

| Sample ID (ANN94-): | ESN-SB-226 | ESN-SD-227 | ESN-SB-227 | ESN-SD-230 | ESN-SB-230 | ESN-SC-230 |
|---|---|---|---|---|---|---|
| Depth BGS (inches): | 12 | 0 | 12 | 0 | 12 | 24 |
| Chromium | 285 | 264 | 178 U | 178 U | 178 U | 178 U |
| Manganese | 781 | 516 | 561 | 409 U | 409 U | 703 |
| Iron | 30,071 | 23,777 | 24,319 | 19,387 | 18,687 | 26,125 |
| Cobalt | 174 U | 174 U | 174 U | 174 U | 174 U | 174 U |
| Nickel | 57 | 67 | 59 | 88 | 84 | 61 |
| Copper | 49 U | 49 U | 98 | 49 U | 49 U | 49 U |
| Zinc | 94 | 132 | 276 | 300 | 866 | 246 |
| Arsenic | 33 U | 33 U | 43 U | 33 U | 60 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 4 | 2 U | 5 | 4 | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 52 | 93 | 427 | 288 | 600 | 90 |

Key at end of table.

## Table 4-2

## EXPANDED SITE INVESTIGATION
## NDB/H-MARKER FACILITY
## LEVEL II SOIL SAMPLES
## XRF METALS RESULTS (mg/kg)
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## JUNE 1994

| Sample ID (ANN94-): | ESN-SD-232 | ESN-SB-232 | ESN-SC-232 | ESN-SD-260 | ESN-SB-260 |
|---|---|---|---|---|---|
| Depth BGS (inches): | 0 | 12 | 24 | 0 | 12 |
| Chromium | 178 U | 178 U | 178 U | 178 U | 185 |
| Manganese | 409 U | 409 U | 409 U | 421 | 409 U |
| Iron | 16,524 | 22,239 | 20,520 | 14,508 | 393 |
| Cobalt | 174 U | 174 U | 174 U | 174 U | 174 U |
| Nickel | 114 | 70 | 43 | 26 U | 26 U |
| Copper | 49 U | 104 | 49 U | 66 | 49 U |
| Zinc | 461 | 1,078 | 532 | 1,079 | 418 |
| Arsenic | 75 U | 89 U | 44 U | 33 U | 33 U |
| Selenium | 16 U | 16 U | 16 U | 16 U | 16 U |
| Molybdenum | 3 | 6 | 4 | 2 U | 2 U |
| Mercury | 35 U | 35 U | 35 U | 35 U | 35 U |
| Lead | 746 | 891 | 445 | 256 | 43 |

Key at end of table.

**Table 4-2 (Cont.)**

Key:

| | | |
|---|---|---|
| BGS | = | Below ground surface. |
| FAA | = | Federal Aviation Administration, Alaskan Region. |
| ID | = | Identification. |
| mg/kg | = | Milligrams per kilogram. |
| NDB | = | Nondirectional beacon. |
| SB | = | Subsurface soil 1 foot below ground surface. |
| SC | = | Subsurface soil 2 feet below ground surface. |
| SD | = | Surface soil. |
| U | = | Element was undetected. Reported result is the instrument detection limit. |
| XRF | = | X-ray flourescence. |

**Table 4-3**

**ESI SOIL SAMPLES
LEVEL III TOTAL LEAD ANALYSIS
NDB FACILITY
ANNETTE ISLAND FAA STATION ESI
ANNETTE ISLAND, ALASKA
JUNE 1994
(mg/kg)**

| Sample Number (ANN94-) | Description | Lead |
|---|---|---|
| ESN-SD-400 | Source: surface soil | 580 |
| ESN-SB-400 | Source: subsurface soil 1 foot BGS | 950 |
| ESN-SD-401 | Source: surface soil | 530 |
| ESN-SD-402 | Source: surface soil | 4,400 |
| ESN-SD-403 | Source: surface soil | 67 |
| ESN-SB-404 | Source: subsurface soil 1 foot BGS | 4,800 |
| ESN-SB-405 | Source: subsurface soil 1 foot BGS | 240 |

**Table 4-4**

**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
LEVEL IV ANALYSIS
NDB FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

| Sample Number (ANN94-): | ESN-SD-100 | ESN-SB-100 | ESN-SD-101 | ESN-SE-100 |
|---|---|---|---|---|
| **Metals** | | | | |
| Aluminum | 2,880 | 3,790 | 3,980 | 7,270 |
| Arsenic | 5.8 | 31.5 | 3.0 | ND |
| Barium | 145 | 81.2 | 61.6 | 17.0 |
| Beryllium | 0.12 | 0.13 | 0.11 | 0.16 |
| Calcium | 1,490 J | 3,470 J | 1,480 J | 1,060 |
| Chromium | 57.1 | 118 | 298 | 8.4 |
| Cobalt | 28.3 | 73.6 | 5.7 | 4.7 |
| Copper | 35.1 J | 86.7 J | 26.1 J | 4.0 |
| Iron | 15,500 | 38,600 | 9,760 | 4,820 J |
| Lead | 1,990 | 1,040 | 2,450 | 10.3 J |
| Magnesium | 34,900 | 129,000 | 6,140 | 4,890 |
| Manganese | 381 | 676 | 111 | 62.8 |
| Nickel | 159 | 592 | 23.7 | 22.5 |
| Potassium | 308 | ND | 603 | ND |
| Selenium | 0.56 J | 2.3 J | ND | ND |
| Vanadium | 12.0 | 15.7 | 11.8 | 12.8 |
| Zinc | 345 J | 701 J | 141 J | 29.7 |

Key at end of table.

## Table 4-4

## ESI SOIL AND SEDIMENT SAMPLES
## POSITIVELY IDENTIFIED INORGANIC COMPOUNDS
## LEVEL IV ANALYSIS
## NDB FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## (mg/kg)

| Sample Number (ANN94-): | ESN-SE-101 | ESN-SE-102 | ESN-SE-103 | ESN-SD-402 |
|---|---|---|---|---|
| **Metals** | | | | |
| Aluminum | 1,950 | 5,160 | 10,200 | NA |
| Arsenic | ND | 1.3 J | 1.0 | NA |
| Barium | 6.1 | 37.1 | 75.4 | NA |
| Beryllium | ND | 0.14 | 0.21 | NA |
| Calcium | 773 | 1,650 | 1,600 | NA |
| Chromium | 2.1 | 6.5 | 5.9 | NA |
| Cobalt | ND | 5.0 | 10.3 | NA |
| Copper | ND | 3.0 | 11.2 | NA |
| Iron | 3,720 J | 16,300 J | 18,300 J | NA |
| Lead | 1.4 J | 9.5 J | 2.1 J | 3,270 J |
| Magnesium | 1,050 | 3,110 | 7,880 | NA |
| Manganese | 38.8 | 137 | 253 | NA |
| Nickel | ND | 33 | 7.6 | NA |
| Potassium | ND | 608 | 3,090 | NA |
| Selenium | ND | ND | ND | NA |
| Vanadium | 3.4 | 14.9 | 38.8 | NA |
| Zinc | 26.6 | 46.1 | 53.1 | NA |

Key:

J = Estimated concentration.
mg/kg = Milligrams per kilogram.
NA = Not analyzed.
SD = Surface soil.
SB = Subsurface soil.
SE = Sediment.

**Table 4-5**

**ESI SOIL AND SEDIMENT, SAMPLES
POSITIVELY IDENTIFIED DIOXIN ISOMERS, LEVEL IV ANALYSIS
NDB FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(ng/kg)**

| Sample Number (ANN94-): | ESN-SD-100 | ESN-SB-100 | ESN-SD-101 | ESN-SE-100 |
|---|---|---|---|---|
| **Dioxin Isomers** | | | | |
| 1,2,3,4,6,7,8-HpCDD | ND | 22.0 | ND | ND |
| OCDD | 182 | 85.4 | 88.7 | ND |
| 1,2,3,4,7,8-HxCDF | ND | 4.64 | ND | ND |
| 1,2,3,6,7,8-HxCDF | ND | 2.50 | ND | ND |
| 1,2,3,4,6,7,8-HpCDF | 4.86 | 6.75 | ND | ND |
| TEF | 0.231 | 1.08 | 0.0887 | 0 |
| Total TCDD | ND | ND | ND | ND |
| Total PeCDD | ND | ND | ND | 51.3 |
| Total HpCDD | 28.3 | 22.0 | ND | — |
| Total HxCDD | ND | ND | ND | 130 |
| Total TCDF | ND | ND | ND | 78.9 |
| Total HxCDF | ND | 7.46 | ND | ND |
| Total HpCDF | 5.60 | 11.2 | ND | ND |

Key at end of table.

**Table 4-5**

**ESI SOIL AND SEDIMENT, SAMPLES
POSITIVELY IDENTIFIED DIOXIN ISOMERS, LEVEL IV ANALYSIS
NDB FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(ng/kg)**

| Sample Number (ANN94-): | ESN-SE-101 | ESN-SE-102 | ESN-SE-103 |
|---|---|---|---|
| **Dioxin Isomers** | | | |
| 1,2,3,4,6,7,8-HpCDD | ND | ND | ND |
| OCDD | ND | ND | 16.6 |
| 1,2,3,4,7,8-HxCDF | ND | ND | ND |
| 1,2,3,6,7,8-HxCDF | ND | ND | ND |
| 1,2,3,4,6,7,8-HpCDF | ND | ND | ND |
| TEF | 0 | 0 | 0.0166 |
| Total TCDD | ND | 6.25 | ND |
| Total PeCDD | ND | ND | ND |
| Total HpCDD | ND | ND | ND |
| Total TCDF | ND | 3.75 | ND |
| Total HxCDF | ND | 14 | ND |
| Total HpCDF | ND | ND | ND |

Key:

— = Peaks were detected within detection time window, but they failed one or more criteria and are listed as EMPC.
EMPC = Estimated maximum possible concentration.
ND = Not detected.
ng/kg = Nanograms per kilogram.
SD = Surface soil.
SB = Subsurface soil.
SE = Sediment.
TEF = Total equivalence factor.

## Table 4-6

## EXPANDED SITE INVESTIGATION SOIL AND SEDIMENT SAMPLES POSITIVELY IDENTIFIED ORGANIC COMPOUNDS, LEVEL IV ANALYSIS NDB FACILITY ANNETTE ISLAND FAA STATION ANNETTE ISLAND, ALASKA (µg/kg)

| Sample Number (ANN94-): | ESN-SD-100 | ESN-SB-100 | ESN-SD-101 | ESN-SE-100 | ESN-SE-101 | ESN-SE-102 | ESN-SE-103 |
|---|---|---|---|---|---|---|---|
| **BNA** | | | | | | | |
| Diethylphthalate | 51 J | ND | ND | 95 | ND | ND | 1,400 |
| Phenanthrene | 85 J | ND | ND | ND | ND | ND | ND |
| Fluoranthene | 85 J | 68 J | ND | ND | ND | ND | ND |
| Pyrene | 80 J | 82 J | 92 J | ND | ND | ND | ND |
| Chrysene | ND | ND | 41 J | ND | ND | ND | ND |
| Benzo(b)fluoranthene | 43 J | 51 J | 47 J | ND | ND | ND | ND |

Key:

BNA = Base neutral/acid extractable organic compound.
J = Estimated concentration.
µg/kg = Micrograms per kilogram.
ND = Not detected.
SE = Sediment sample.
SD = Soil sample.
SB = Subsurface soil.

**Table 4-7**

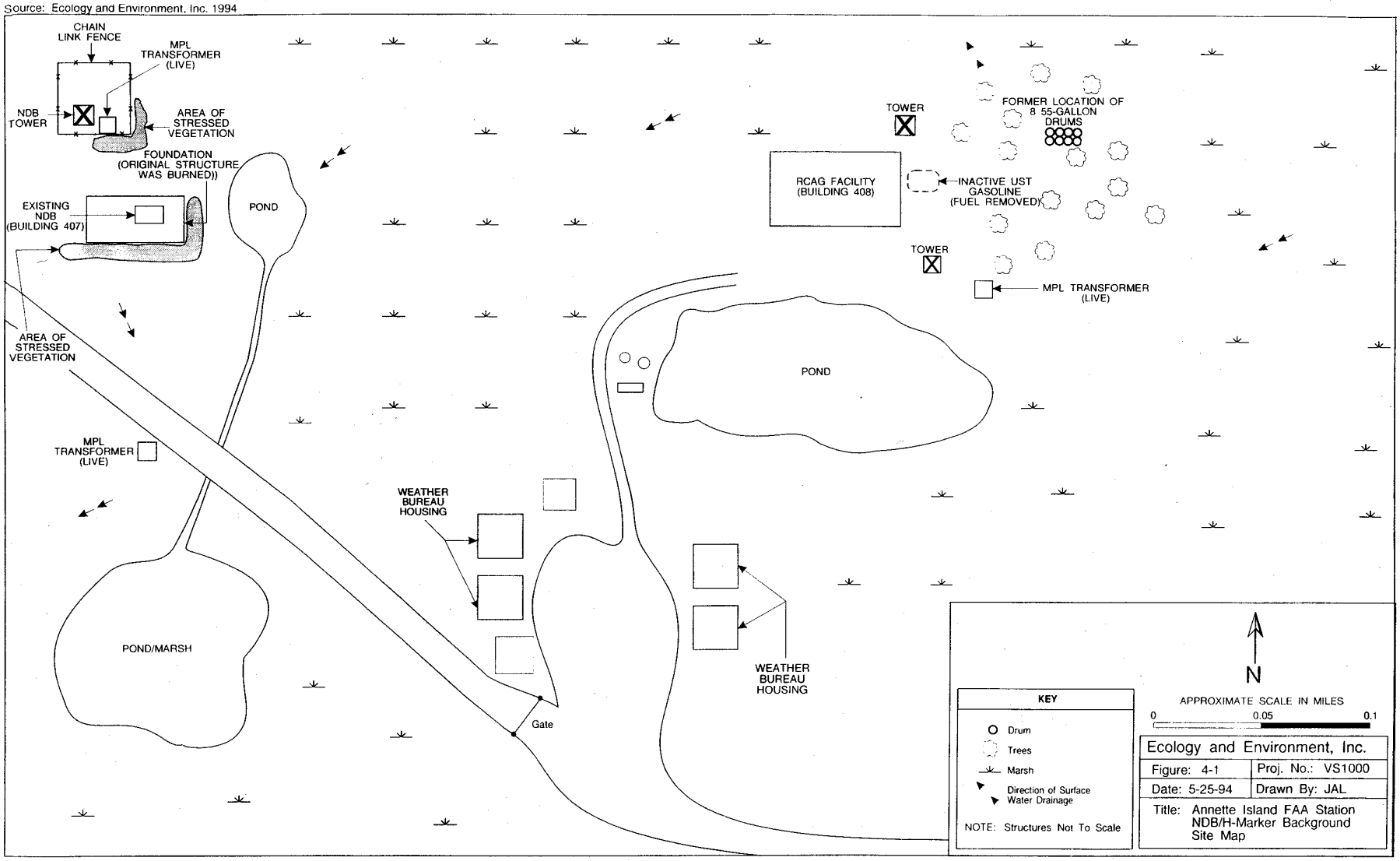
**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED TCLP METALS, LEVEL IV ANALYSIS
NDB FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/L)**

| Sample Number (ANN94-): | ESN-SD-100 | ESN-SB-100 | ESN-SD-101 | ESN-SD-402 | Regulatory Limit |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| Barium | 0.75 J | 1.2 J | 0.78 J | NA | 100.0 |
| Cadmium | 0.0053 J | ND | 0.0066 J | NA | 1.0 |
| Chromium | 0.031 J | ND | 0.090 J | NA | 5.0 |
| Lead | 3.0 J | 1.5 J | 1.2 J | 14.3 J | 5.0 |

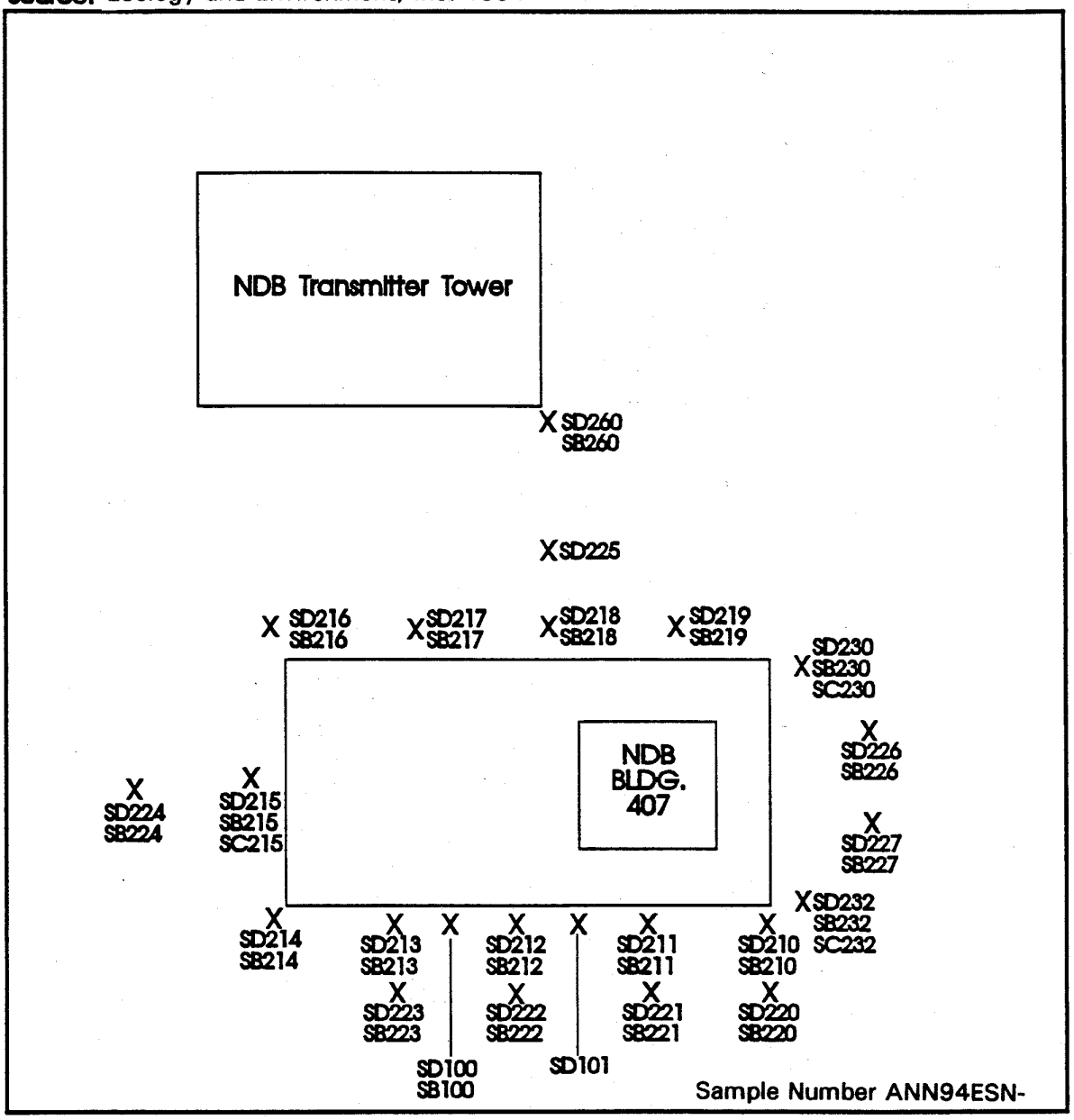
Key:

J = Estimated.
mg/L = Milligrams per liter.
NA = Not analyzed.
SD = Soil sample.
SB = Subsurface soil sample.
TCLP = Toxic characteristic leaching procedure.

Source: Ecology and Environment, Inc. 1994



**Source:** Ecology and Environment, Inc. 1994




| KEY |
|---|
| SD = composite surface soil sample |
| SB = grab soil sample at 1 foot BGS |
| SC = grab soil sample at 2 feet BGS |
| X = sample location |

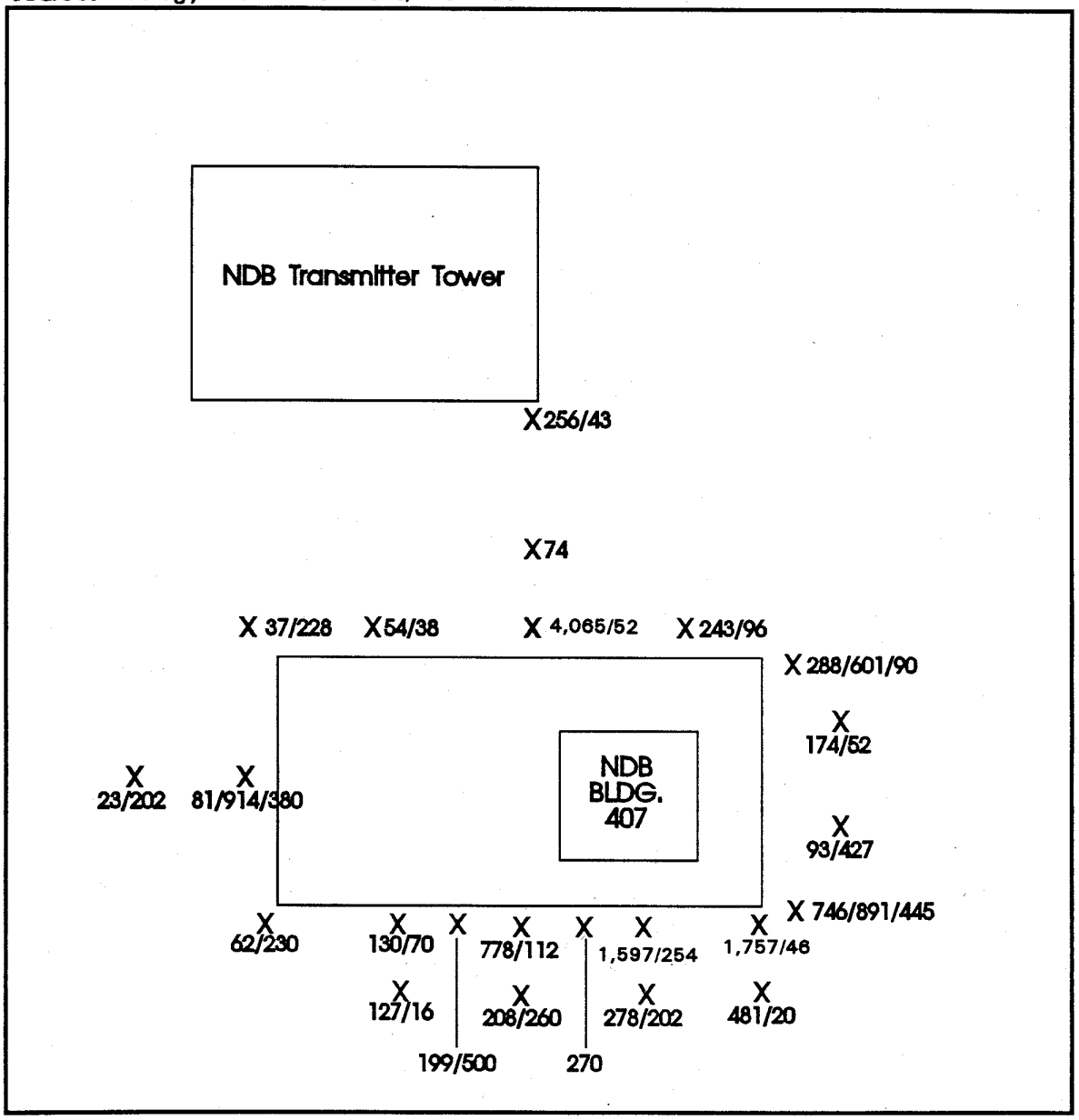
N

0 20 40

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 4 - 2 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |
| Title: Annette Island FAA Station ESI NDB Facility Level II XRF Screening Sample Locations June 1994 | |

**Source:** Ecology and Environment, Inc. 1994




N

KEY:

746/891/445 = surface/1 foot BGS/2 feet BGS
X = sample location

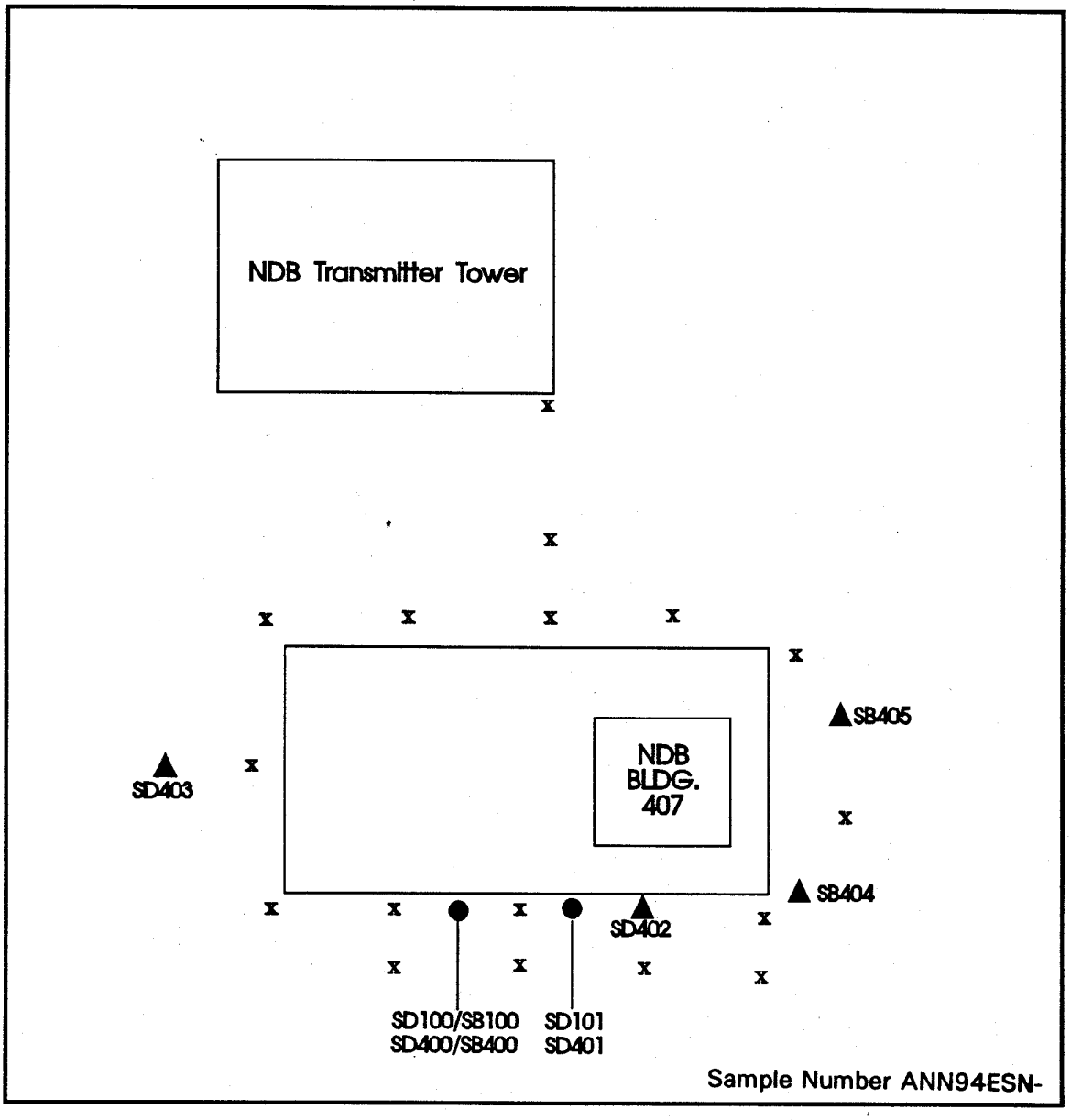
0 20 40

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 4 - 3 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |

Title: Annette Island FAA Station ESI
NDB Facility Level II XRF Screening
Lead Results Map (mg/kg)
June 1994

Source: Ecology and Environment, Inc. 1994




| KEY: |
|---|
| ● = level IV sample location |
| ▲ = level III sample location |
| SD = composite surface soil sample |
| SB = grab soil sample at 1 foot BGS |

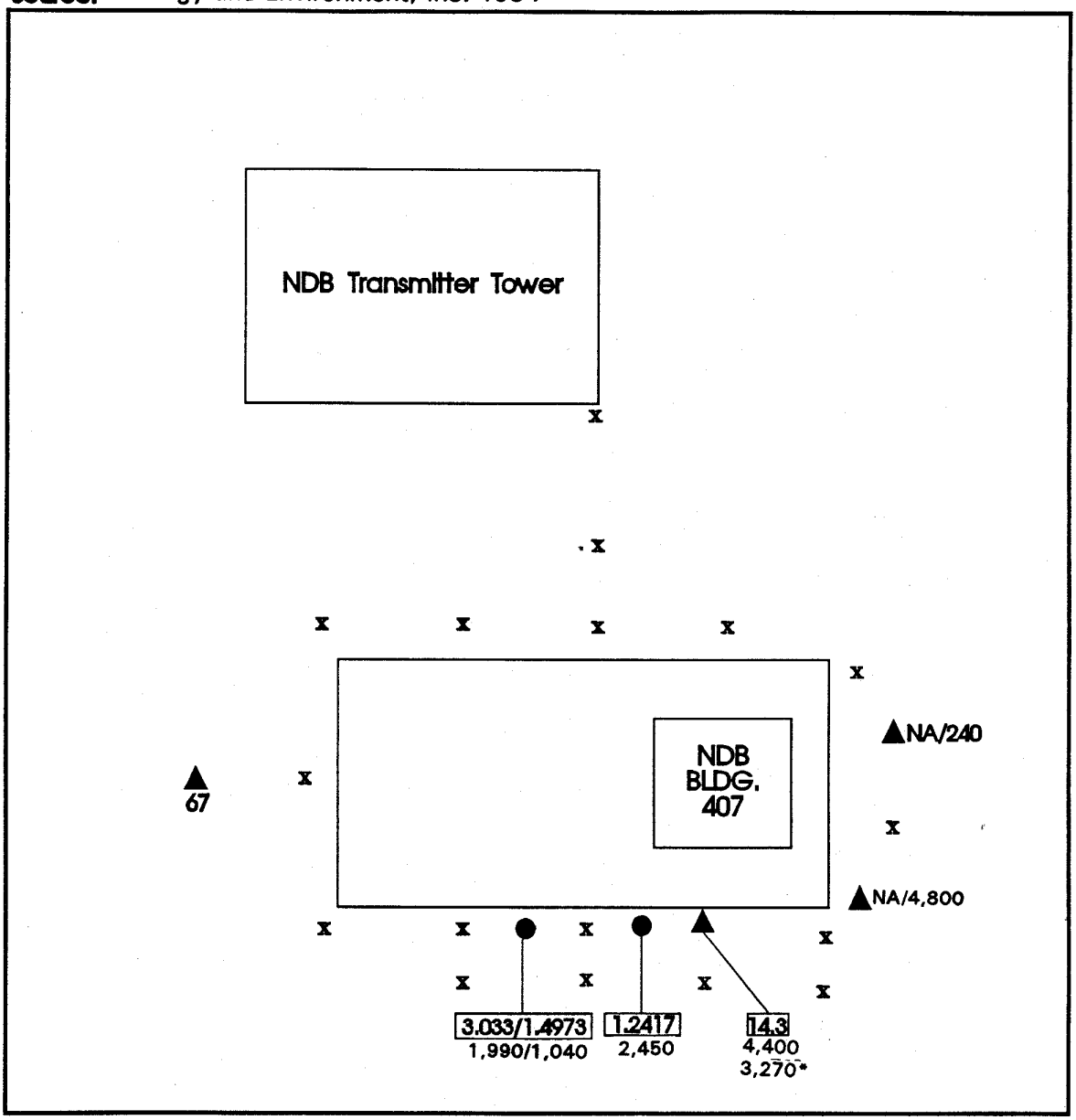
N

0 20 40

SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 4 - 4 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |
| Annette Island FAA Station ESI<br>NDB Facility Level III & IV<br>Sample Location Map<br>June 1994 | |

**Source:** Ecology and Environment, Inc. 1994




N

**KEY:**

1.2417 = TCLP Extractable lead (mg/l)

1,990/1,040= surface/ 1 foot BGS TAL lead (mg/kg)

● = level IV sample location

▲ = level III sample location

NA = not analyzed

* = TAL lead only reanalysis

0 20 40

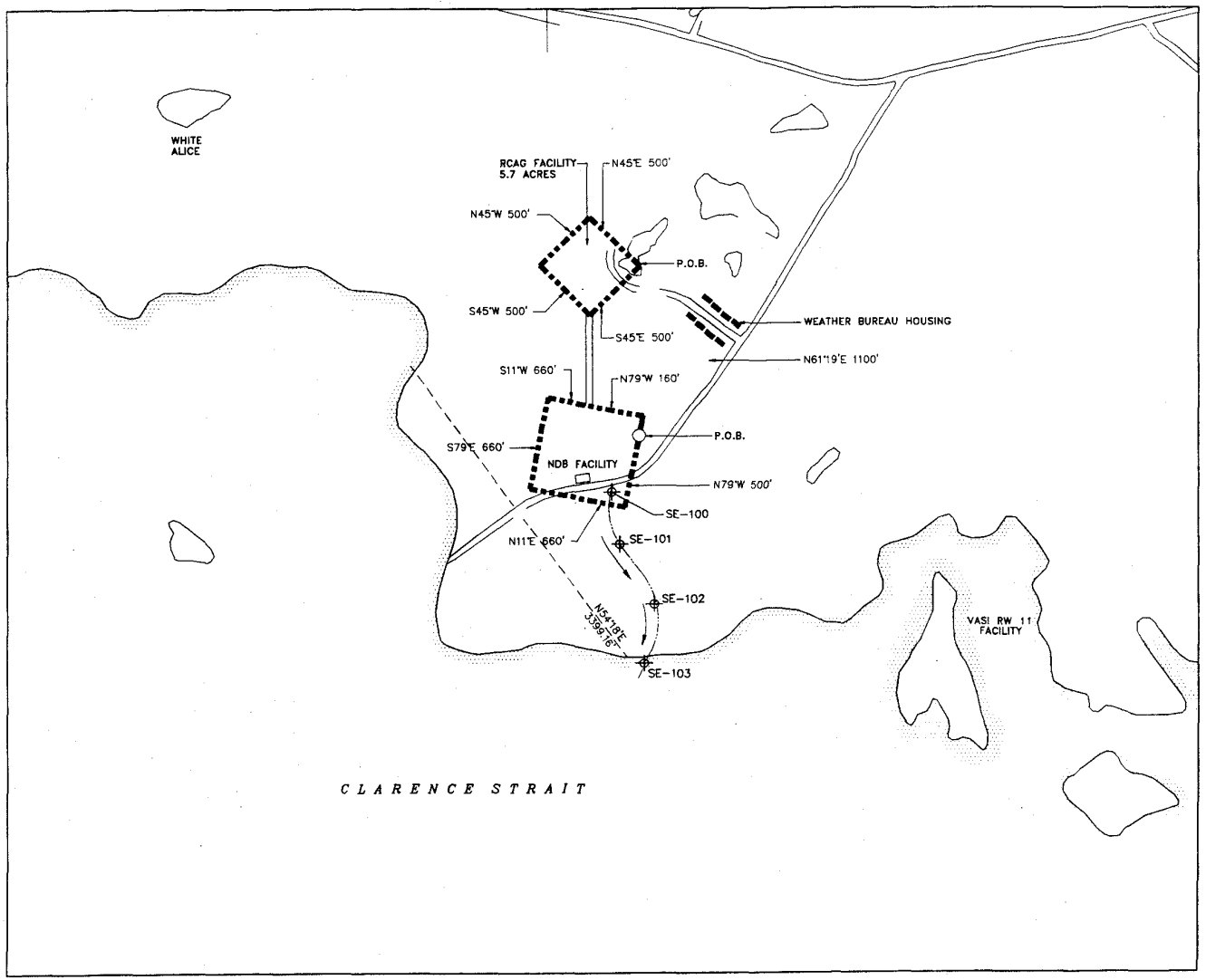
SCALE IN FEET

| Ecology and Environment Inc. | |
|---|---|
| Figure: 4 - 5 | Proj. No: VS1050 |
| Date: 9-9-94 | Drawn by: DEH |

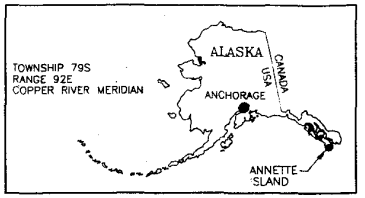
Annette Island FAA Station ESI
NDB Facility Level III & IV
TAL and TCLP Lead Results Map
June 1994

VS1S005B

Source: ALD-ANN-020.003




LOCATION MAP




LEGEND

SHORES

SE-103 SAMPLE LOCATIONS (ANN94-ESN- )

SURFACE WATER FLOW

N

APPROXIMATE SCALE IN FEET

0 500 1000 1500 2000

| Ecology and Environment Inc. | |
|---|---|
| Figure: 4-6 | Proj. No: VR1000 |
| Date: 9/08/94 | Drawn by: EGM |
| Title: ANNETTE ISLAND FAA STATION NDB FACILITY OVERLAND SURFACE WATER PATHWAY AND TARGET SAMPLE LOCATION MAP | |

# 5. REMOTE CENTER AIR/GROUND COMMUNICATIONS FACILITY

## 5.1 LOCATION AND DESCRIPTION

The RCAG is an inactive facility located approximately 1.5 miles northwest of the north end of the runway on 5.7 acres (see Figures 2-1 and 5-1).

The RCAG facility consists primarily of Building 408, which is constructed of concrete block. Surrounding structures include an inactive 500-gallon gasoline UST, a live MPL transformer, two antenna towers and a former drum storage area. The surrounding property is mostly marsh and muskeg. A small pond is located south of Building 408. The RCAG has been operated by FAA since 1948.

The former drum storage area was the focus of the ESI sampling effort because the ECI conducted in August 1991 (E & E 1992b) identified the presence of TAL metals in soil samples which exceeded the three times background criteria for the EPA HRS model. The drum storage area was targeted for further investigation in the FAA SOW dated September 29, 1993. The drums were removed on 1993 (E & E 1993a), leaving an area of cleared brush approximately 65 feet south of building 408. The cleared area measured 65 feet long, in the north-south direction and varied in width on average of 20 feet.

## 5.2 EXPANDED SITE INVESTIGATION

### 5.2.1 Level IV Source and Target Sampling

The potential source and surface water pathway for the former drum storage area was assessed. This potential CERCLA source was characterized by collecting three surface soil samples along the length of the clearing: ANN94ESR-SD-100 was collected near the west end; ANN94ESR-SD-101 near the center; and ANN94ESR-SD-102 near the east end. The sample locations are presented in Figure 5-1. All three samples were submitted for Level IV

analysis for TAL metals, TCL parameters, and TCLP metals. A sample summary is presented in Table 5-1 and the results of the analyses are presented in Tables 5-2 to 5-4.

Source samples contained the following concentrations of contaminants at greater than three times background concentrations: copper (481 mg/kg) and zinc (270 mg/kg) in ANN94ESR-SD-100; barium (20.1 mg/kg), copper (26.6 mg/kg), lead (22.6 mg/kg), magnesium (2,020 mg/kg), nickel (13.8 mg/kg), zinc (258 mg/kg), and toluene (957 $\mu$g/kg) in ANN94ESR-SD-101; and magnesium (2,680 mg/kg), nickel (11.8 mg/kg), zinc (162 mg/kg), and toluene (93 $\mu$g/kg) in ANN94ESR-SD-102. No compounds exceeded MSEC criteria.

The wetland adjacent to the RCAG facility was evaluated to determine whether it meets the criteria of a target wetland located in the surface water pathway according to the HRS model. One runoff pathway was identified that extended from the former drum storage area northeast to Smuggler Cove (see Section 5.2.4 for a complete discussion of the pathways). Samples were not collected at the point of entry into the wetland since the source samples were within the target wetland. Sediment samples were collected at approximately 0.1 mile and 0.2 mile downgradient of the source area and at the end of the drainage pathway at the beach at Smuggler Cove. The beach sample was collected from a surface beach area at the mean tide line. Sample locations are presented in Figure 5-2. In addition, one sediment sample was collected from the west side of the pond that is located on the west side of Building 408 (see Figure 5-1). Since the surface water pathway at this facility was difficult to ascertain due to the level terrain, this sample provided information due to potential cross-gradient migration.

No compounds were found to exceed three times background concentrations or MSEC criteria in samples collected from the northeasterly runoff pathway. Sample ANN94E-SB-SD-100, collected on the far side of the pond and west of Building 408, was found to contain the following compounds at concentrations that exceeded three times background: barium (16.2 mg/kg), calcium (3,500 mg/kg), copper (6.78 mg/kg), magnesium (3,230 mg/kg), nickel (17.5 mg/kg), zinc (89.4 mg/kg), toluene (1,000 $\mu$g/kg) and xylene (120 $\mu$g/kg). All of these compounds were detected in the source samples. Target sample results are presented in Tables 5-2 and 5-3.

### 5.2.2 Background Samples

Background samples were collected for each distinct sample matrix (soil, sediment, and beach sediment) sampled. The matrices encountered at the RCAG included sandy sediment, peaty sediment, and beach sand. See Sections 2.7.1 and 4.2.4 for a discussion of the background samples.

### 5.2.3 Level IV TCLP Sampling

Source samples ANN94ESR-SD-100, ANN94ESR-SD-101, and ANN94ESR-SD-102 were also submitted for Level IV TCLP metals analysis. The results are presented in Table 5-4. No samples were found to exceed TCLP regulatory limits.

### 5.2.4 Wetlands Survey

The primary objective of the wetland survey was to identify wetlands 0.2 mile downgradient of the source. See Section 3.2.1.3 for the definition of a wetland and a discussion of Annette Island wetlands. The RCAG sits on a gravel pad vegetated by upland species. It is surrounded by a large shore pine-yellow cedar muskeg wetland complex. A pond lies northwest of the RCAG. The potential source of contaminants was the former drum storage area located in a small depression within the wetland complex immediately adjacent to south edge of the gravel pad.

Since the potential source was in a wetland, the size of the wetland was determined. In addition, the source was in a depression that was part of a larger wetland complex. Defined drainage patterns existed into and out of the depression; therefore, only the size of the depression was determined and not the entire wetland complex. The depression was 1,340 square feet or 0.031 acres in size. The wetlands in the immediate vicinity of the source were separated by microtopographic changes. The depressional wetland contained shore pine and sweet gale in the shrub/scrub layer and deer cabbage, evergreen huckleberry, false lily of the valley, and sphagnum moss in the herbaceous layer. No tree stratum was present. Trees in the depressional wetland appeared to have been cut down. The soils in this wetland were organic, and standing water was encountered within 12 inches of the ground surface in a soil pit. On the north and east sides of the depressional wetland, yellow cedars approximately 50 feet in height, shore pines, and evergreen huckleberries grew on a topographic rise in an organic soil. Sitka alders grew on a topographic rise on the south side of the depression and separated the source depression from another depression which sloped towards the pond. This

depression was dominated by labrador tea. The overland surface water drainage pathway is shown in Figures 3-4 and 5-2.

From the depression, the direction of drainage was to the northeast for approximately 30 feet, at which point the slope of the terrain increased. The drainage followed the slope of a hill and began to channelize. At the base of the hill was an open water area which drained to the northeast. The side of the hill and open water area are in a shore pine-cedar muskeg wetland complex. A channel exited the openwater area to the northwest. ANN94ESR-SE-101 was collected approximately 0.1 mile from the source in this channel. The channel contained approximately 6 inches of water, was approximately 2.5 feet deep, and contained organic and sandy soils. At this sampling location, the predominant vegetation included yellow cedar, shore pine, and western redcedar in the tree stratum; sweet gale, labrador tea, and fool's huckleberry in the shrub stratum; and deer cabbage, skunk cabbage, false lily of the valley, black lily *(Fritillaria camschatcensis)*, dwarf dogwood, labrador tea, and sphagnum moss in the herbaceous layer.

The stream channel then entered a forested wetland. The stream channel meandered through the forested wetland and eventually drained into an estuarine pond that drained into the ocean. ANN94ESR-SE-102 was collected in the forested wetland approximately 0.2 mile downgradient of the source and within an approximate 3-foot-deep stream channel, that contained approximately 6 inches of water. The stream channel consisted of a sandy gravelly substrate, and the stream banks were composed of organic soils. No vegetation was growing within the stream channel. Yellow cedars, western redcedar, and hemlock grew in the tree and shrub/shrub strata on the channel banks. Skunk cabbage and sphagnum moss dominated the herb layer on the channel banks.

ANN94ESR-SE-103 was collected on the beach below the high tide line and within the flow of water from the stream drainage. The sample was collected downgradient of a pond and an apparent estuarine marsh and was composed of sand and gravel.

### 5.2.5 Deviations From the Work Plan

All work at the RCAG facility was performed as specified in the ESI work plan except that the surface water runoff pathway was thought to be the same for both the RCAG and the NDB/H-marker facilities. After inspecting the pathway, it was determined that they were separate, and three additional sediment samples and one additional beach sample were required to characterize the pathway at the RCAG.

### 5.2.6 ESI Conclusions and Recommendations

There are no ESI concerns at the RCAG facility that require further action.

## 5.3 INTERIM CLEANUP ACTIVITY

### 5.3.1 Field Activities

The IC activity was performed as specified in the IC work plan. The abandoned 500-gallon gasoline UST was pumped-out in preparation for the decommissioning of the tank. The location of the tank is shown in Figure 5-1. One hundred gallons of fuel were estimated to be present at the time of the work plan preparation; however, when the tank was inspected during the IC, it was found to be empty. Approximately 5 gallons of water (and a minor amount of fuel) was pumped from the tank into a 55-gallon drum. A local resident, who anticipated taking the fuel from the tank for personal use, took the 55-gallon drum. He planned to allow the water to evaporate and use the drum for fuel storage. The empty UST was capped and locked.

### 5.3.2 Conclusions and Recommendations

The IC project was completed. Further action is required to decommission the empty UST according to ADEC regulations.

## Table 5-1

## EXPANDED SITE INVESTIGATION SAMPLE SUMMARY
## RCAG FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ESR-SD-100 | Soil | VOC, BNA, Pest/PCB, TAL metals, TCLP Metals | ASC/Level IV | Source sample. SSE of Building |
| ESR-SD-101 | Soil | VOC, BNA, Pest/PCB, TAL metals, TCLP Metals | ASC/Level IV | Source sample. SE of building |
| ESR-SD-102 | Soil | VOC, BNA, Pest/PCB, TAL metals, TCLP Metals | ASC/Level IV | Source sample. S of building. |
| ESR-SE-101 | Stream sediment | VOC, BNA, Pest/PCB, TAL metals | ASC/Level IV | Wetland. 0.1 mile downgradient and east of source. |
| ESR-SE-102 | Stream sediment | VOC, BNA, Pest/PCB, TAL metals | ASC/Level IV | Wetland. 0.2 mile downgradient and east of source. |
| ESR-SE-103 | Beach sediment | VOC, BNA, Pest/PCB, TAL metals | ASC/Level IV | Beach at end of drainage. |
| ESB-SD-100 | Peaty sediment | VOC, BNA, Pest/PCB, TAL metals | ASC/Level IV | Wetland. Across pond west of building. |

Key:

ASC = Analytical Service Center.
BNA = Base neutral/acid extractable organic compound.
Pest/PCB = Organochlorine pesticides/polychlorinated biphenyls.
SD = Surface Soil.
SE = Sediment.
TAL metals = Target Analyte List metals.
TCLP metals = Toxic Characteristic Leaching Procedure Metals.
VOC = Volatile organic compound.

**Table 5-2**

**ESI SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED INORGANIC COMPOUNDS,
LEVEL IV ANALYSIS
RCAG FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

| Sample Number (ANN94-): | ESR-SE-103 | ESB-SD-100 | ESR-SD-100 | ESR-SD-101 |
|---|---|---|---|---|
| **Metals** | | | | |
| Aluminum | 5,550 | 811 | 807 | 676 |
| Arsenic | ND | ND | ND | ND |
| Barium | 66.9 | 16.2 | ND | 20.1 |
| Beryllium | 0.13 | ND | ND | ND |
| Calcium | 1,450 | 3,500 J | 805 J | 4,850 J |
| Chromium | 1.7 | ND | ND | ND |
| Cobalt | 5.4 | ND | ND | ND |
| Copper | 4.3 | 6.7 J | 481 J | 26.6 J |
| Iron | 8,480 J | 1,560 | 1,100 | 1,170 |
| Lead | ND | 14.2 J | ND | 22.6 J |
| Magnesium | 4,010 | 3,230 | 863 | 2,020 |
| Manganese | 134 | 16.5 | 4.3 | 11.2 |
| Nickel | 4.1 | 17.5 | ND | 13.8 |
| Potassium | 1,720 | ND | ND | ND |
| Vanadium | 21.6 | ND | ND | ND |
| Zinc | 21.4 | 89.4 J | 270 J | 258 J |

Key at end of table.

## Table 5-2

## ESI SOIL AND SEDIMENT SAMPLES POSITIVELY IDENTIFIED INORGANIC COMPOUNDS, LEVEL IV ANALYSIS RCAG FACILITY ANNETTE ISLAND FAA STATION ANNETTE ISLAND, ALASKA (mg/kg)

| Sample number (ANN94-) | ESR-SD-102 | ESR-SE-101 | ESR-SE-102 |
|---|---|---|---|
| **Metals** | | | |
| Aluminum | 858 | 6,780 | 2,910 |
| Arsenic | ND | 0.75 | 1.8 J |
| Barium | 11.6 | 21.4 | 10.4 |
| Beryllium | ND | 0.15 | 0.07 |
| Calcium | 1,140 J | 1,960 | 946 |
| Chromium | ND | 6.4 | 4.1 |
| Cobalt | ND | 6.3 | 2.3 |
| Copper | 4.7 J | 8.8 | 2.8 |
| Iron | 942 | 8,950 J | 4,450 J |
| Lead | 7.9 J | 2.3 J | 2.3 J |
| Magnesium | 2,680 | 4,590 | 1,640 |
| Manganese | 9.5 | 154 | 77.3 |
| Nickel | 11.8 | 6.5 | 5.2 |
| Potassium | ND | 335 | ND |
| Vanadium | ND | 21.1 | 8.3 |
| Zinc | 162 J | 43.6 | 29.6 |

Key:

J = Estimated concentration.
mg/kg = Milligrams per kilogram.
ND = Not detected.
SE = Sediment sample.
SD = Soil sample.

## Table 5-3

## EXPANDED SITE INVESTIGATION SOIL AND SEDIMENT SAMPLES
## POSITIVELY IDENTIFIED ORGANIC COMPOUNDS, LEVEL IV ANALYSIS
## RCAG FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## (µg/kg)

| Sample Number (ANN94-) | ESR-SD-100 | ESR-SD-101 | ESR-SD-102 | ESR-SE-101 | ESR-SE-102 | ESR-SE-103 | ESB-SD-100 |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| Toluene | 15 B | 57 J | 93 J | ND | ND | ND | 1,000 |
| Total Xylenes | 11 J | ND | ND | ND | ND | ND | 120 |
| **BNA** | | | | | | | |
| Phenanthrene | ND | 1,400 J | ND | ND | ND | ND | 380 J |
| Anthracene | ND | 200 J | ND | ND | ND | ND | ND |
| Fluoranthene | ND | 790 J | ND | ND | ND | ND | 380 J |
| Pyrene | ND | 1,400 J | ND | ND | ND | ND | ND |
| Chrysene | ND | 520 J | ND | ND | ND | ND | ND |

Key:

B = Blank contamination.
BNA = Base neutral/acid extractable organic compound.
J = Estimated concentration.
µg/kg = Micrograms per kilogram,
ND = Not detected.
SE = Sediment sample
SD = Soil Sample
VOCs = Volatile organic compounds.

**Table 5-4**

**EXPANDED SITE INVESTIGATION SOIL AND SEDIMENT SAMPLES
POSITIVELY IDENTIFIED TCLP METALS, LEVEL IV ANALYSIS
RCAG FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/L)**

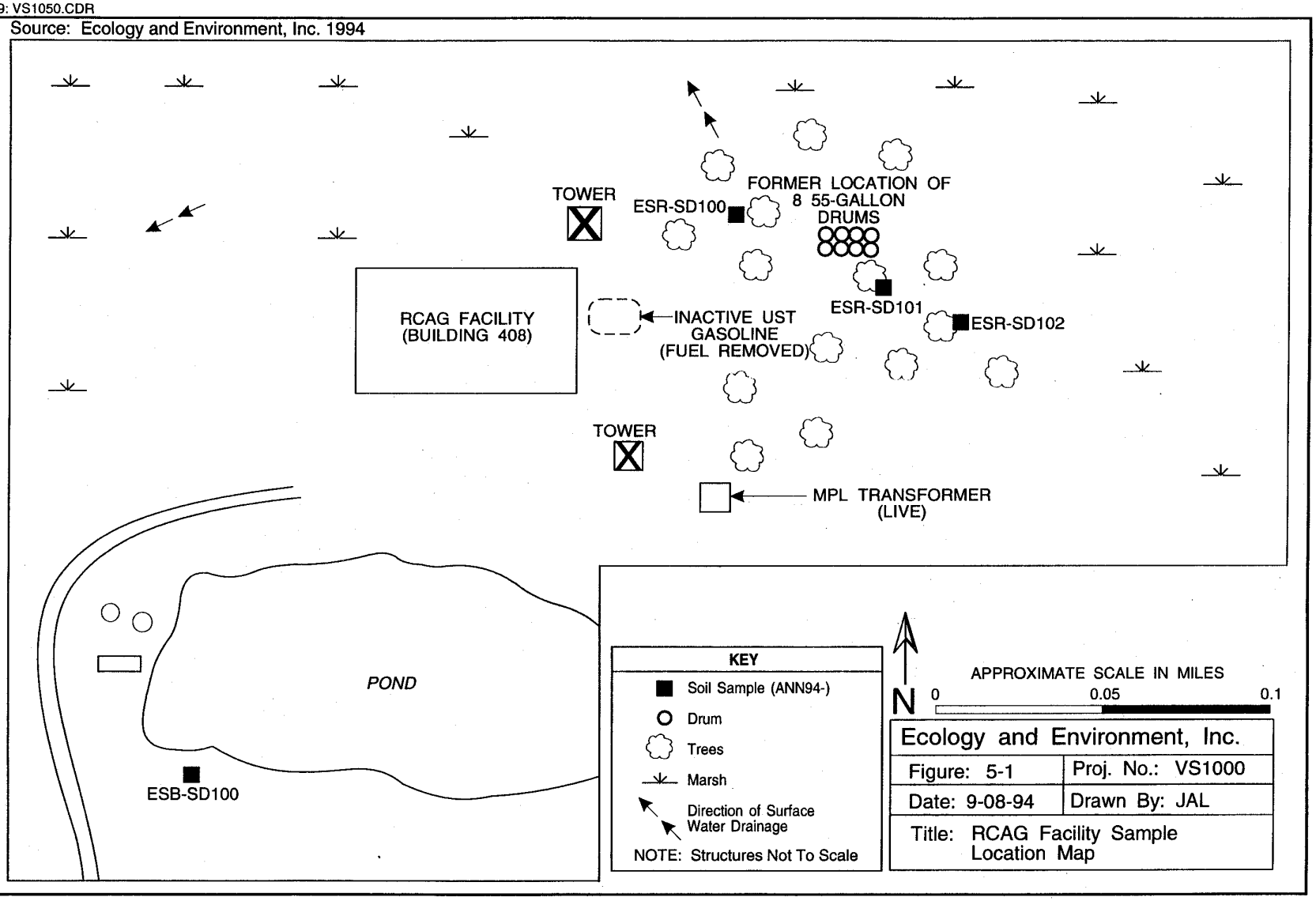
| Sample Number (ANN94-): | ESR-SD-100 | ESR-SD-101 | ESR-SC-102 |
|---|---|---|---|
| Barium | 0.93 J | 0.67 J | 0.73 |

Key:

J = Estimated concentration.
mg/L = Milligram per liter.
SD = Soil sample.
TCLP = Toxic Characteristic Leaching Procedure.

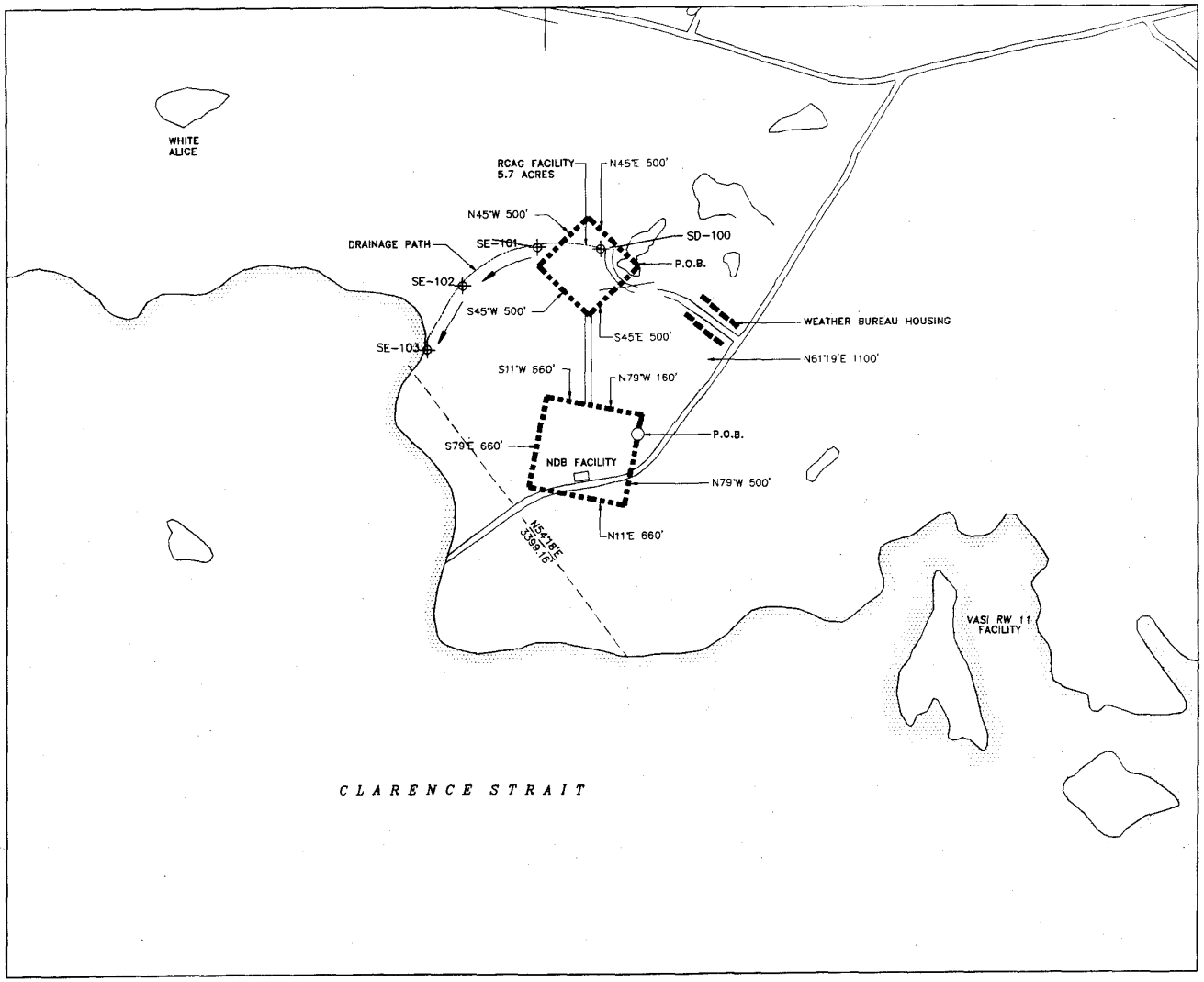
19: VS1050.CDR

Source: Ecology and Environment, Inc. 1994

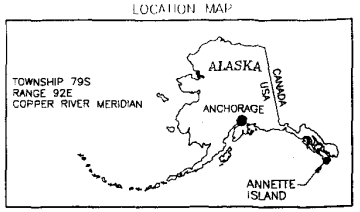



| Ecology and Environment, Inc. | |
|---|---|
| Figure: 5-1 | Proj. No.: VS1000 |
| Date: 9-08-94 | Drawn By: JAL |
| Title: RCAG Facility Sample Location Map | |

Source: ALD-ANN-020.003




LOCATION MAP




LEGEND

SHORES

SE-103 SAMPLE LOCATIONS (ANN94-ESR- )

SURFACE WATER FLOW

APPROXIMATE SCALE IN FEET

0 500 1000 1500 2000

| | |
|---|---|
| Ecology and Environment Inc. | |
| Figure: 5-2 | Proj. No: VR1000 |
| Date: 9/08/94 | Drawn by: EGM |
| Title: ANNETTE ISLAND FAA STATION RCAG FACILITY OVERLAND SURFACE WATER PATHWAY AND TARGET SAMPLE LOCATION MAP | |

# 6. HANGAR FACILITY

## 6.1 LOCATION AND DESCRIPTION

The Hangar facility is located near the south end of the north-south runway (See Figure 1-2). It is currently being used for storage of lumber by the Metlakatla Indian Community. The Hangar facility is located on property formerly leased by FAA. An ECI conducted in August 1991 (E & E 1992b) identified the presence of several PCB-containing transformers in a room on the northeast corner of the building, (see Figure 6-1). The transformers were removed in 1992 under Task Order No. 13 (E & E 1993a).

## 6.2 INTERIM CLEANUP

### 6.2.1 Field Activities

The hangar-floor PCB remediation program required the cleanup of a small section of the northeast room within the Hangar facility (Figure 6-2). The estimated area of the affected floor was 200 square feet. The initial task was to sweep the affected area to remove sawdust, paint chips, and debris. The debris was analyzed with the XRF and was found to contain a total lead concentration of 2,430 ppm. The source of the lead containing material appeared to be paint chips peeled from facility walls. The floor sweepings were containerized, manifested, and disposed of as hazardous material. The shipping manifests are presented in Appendix E of Volume 2.

Following the general floor sweeping, the stained areas were cleaned using PES-51 citrus-based-solvent. The stained areas were repeatedly scrubbed and wiped with absorbent pads until the stain was no longer visible. In the process of removing the stains, the painted surface was also removed leaving bare concrete. The floor cleaning was followed by the collection of three wipe samples in accordance with EPA Region X PCB wipe sample protocol. These samples were analyzed in the field using an ENSYS PCB RISc wipe test kit

and all were found to contain less than 10 $\mu g/100\ cm^2$ of PCB, which is EPA's action level for indoor low-contact impervious surfaces. ENSYS PCB RISc analysis protocol is presented in Appendix F.5.

Confirmation samples were then collected from each of the three areas that had been field tested, and the samples were submitted to an analytical laboratory for quick-turnaround confirmation analysis. The confirmation samples were numbered ANN94ICH-OI-400 through ANN94ICH-OI-403. Sample ANN94ICH-OI-403 was submitted as a blank QC sample. The location of the samples are shown in Figure 6-2 along with the analytical results. The confirmation analysis indicated that PCBs were present in much higher concentration, ranging from 456 to 4,590 $\mu g/100\ cm^2$, even though the field screening results indicated $< 10\ \mu g/100\ cm^2$ PCB. PCBs were not detected in the blank sample. A summary of samples collected at the Hangar facility are presented in Table 6-1.

Because the stained areas exceeded the 10 $\mu g/100\ cm^2$ criteria, the study area was recleaned using hexane, a stronger solvent. Confirmation samples were again collected and submitted for quick-turnaround laboratory analysis. The confirmation samples were numbered ANN94ICH-OI-430 through ANN94ICH-OI-433. Sample ANN94ICH-OI-432 was submitted as a blank QC sample. The location of the samples are shown in Figure 6-2 along with the analytical results. In general, the concentration of Aroclor 1260 was decreased by the second cleaning; however, the concentrations still remained greater than 100 $\mu g/100\ cm^2$. PCBs were not detected in the blank sample. Sample results are presented in Table 6-2.

The PCB-contaminated sampling and wipe material from the initial cleaning and the lead contaminated floor sweepings were contained in one 55-gallon drum, manifested and shipped by the subcontractor in compliance with applicable EPA regulations. The material was transported from Annette Island by licensed chartered aircraft to Anchorage and transferred to an approved RCRA disposal facility. The shipment manifest was provided to FAA and the mandatory EPA PCB importation letter will be forwarded to EPA as prescribed in the regulations. The shipping manifests are presented in Appendix E of Volume 2.

The PCB-contaminated sampling and wipe material from the second cleaning was contained in one 30-gallon drum and placed in the hazardous materials storage building located at the VORTAC/DF facility (Figure 3-1). The drum will be stored there until it can be transferred to a RCRA disposal facility.

### 6.2.2 Deviations From Work Plan

All work at the Hangar facility was performed in accordance with the IC work plan. As discussed in Section 6.2.3, the PCB contamination that remains following the cleaning of the Hangar floor, requires additional remediation.

### 6.2.3 Conclusions and Recommendations

The floor cleaning procedure used in the Hangar facility was ineffective in reducing PCB concentrations to less than 10 $\mu g/100cm^2$. Additional cleaning or removal of the concrete floor may be required to completely remediate the contaminated area.

## Table 6-1

## INTERIM CLEANUP SAMPLE SUMMARY
## HANGAR FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE, ALASKA

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ICH-OI-200 | PCB wipe | PCB | Field | See Figure 6-2 for location. |
| ICH-OI-201 | PCB wipe | PCB | Field | See Figure 6-2 for location. |
| ICH-OI-202 | PCB wipe | PCB | Field | See Figure 6-2 for location. |
| ICH-OI-400 | PCB wipe | PCB | NTL | See Figure 6-2 for location. |
| ICH-OI-401 | PCB wipe | PCB | NTL | See Figure 6-2 for location. |
| ICH-OI-402 | PCB wipe | PCB | NTL | See Figure 6-2 for location. |
| ICH-OI-403 | PCB wipe | PCB | NTL | Blank |
| ICH-OI-430 | PCB wipe | PCB | NTL | See Figure 6-2 for location |
| ICH-OI-431 | PCB wipe | PCB | NTL | See Figure 6-2 for location. |
| ICH-OI-432 | PCB wipe | PCB | NTL | Blank |
| ICH-OI-433 | PCB wipe | PCB | NTL | See Figure 6-2 for location. |

Key:

NTL = Northern Testing Laboratories.
PCB = Polychlorinated biphenyl.

## Table 6-2

## INTERIM CLEANUP PCB WIPE SAMPLES
## POSITIVELY IDENTIFIED PCBs,
## LEVEL III ANALYSIS
## HANGAR FACILITY
## ANNETTE ISLAND FAA STATION
## ANNETTE ISLAND, ALASKA
## ($\mu$g/100 cm$^2$)

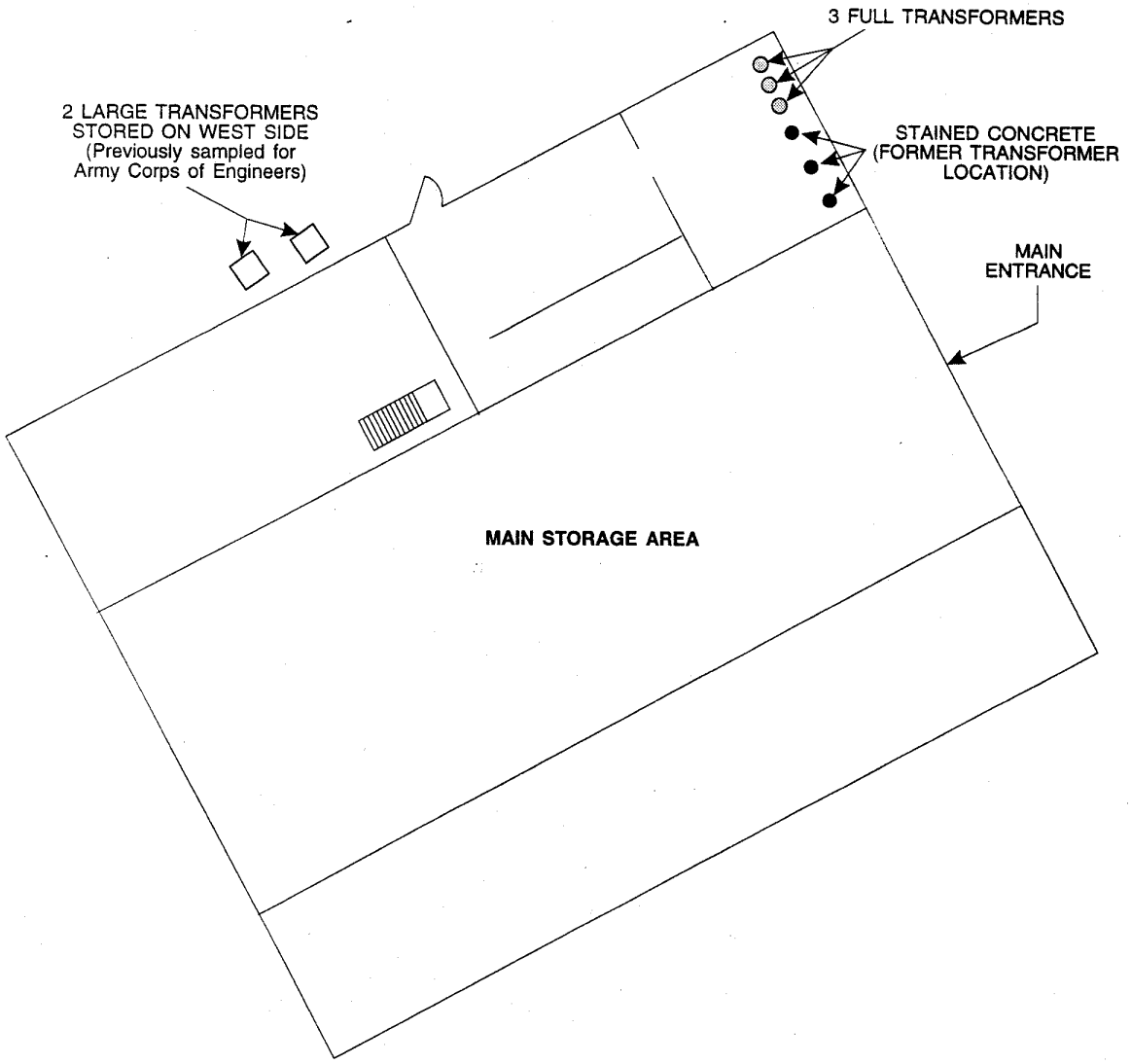
| Sample Number (ANN94-): | ICH-OI-400 | ICH-OI-401 | ICH-OI-402 | ICH-OI-403 (blank) | ICH-OI-430 | ICH-OI-431 | ICH-OI-432 (blank) | ICH-OI-433 |
|---|---|---|---|---|---|---|---|---|
| **PCB** | | | | | | | | |
| Aroclor 1260 | 456 | 4,590 | 3,820 | ND | 1,080 | 633 | ND | 1,110 |

Key:

ND = Not detected.

VS105961.CDR

Source: Ecology and Environment, Inc. 1994




NOTE: Building Not To Scale

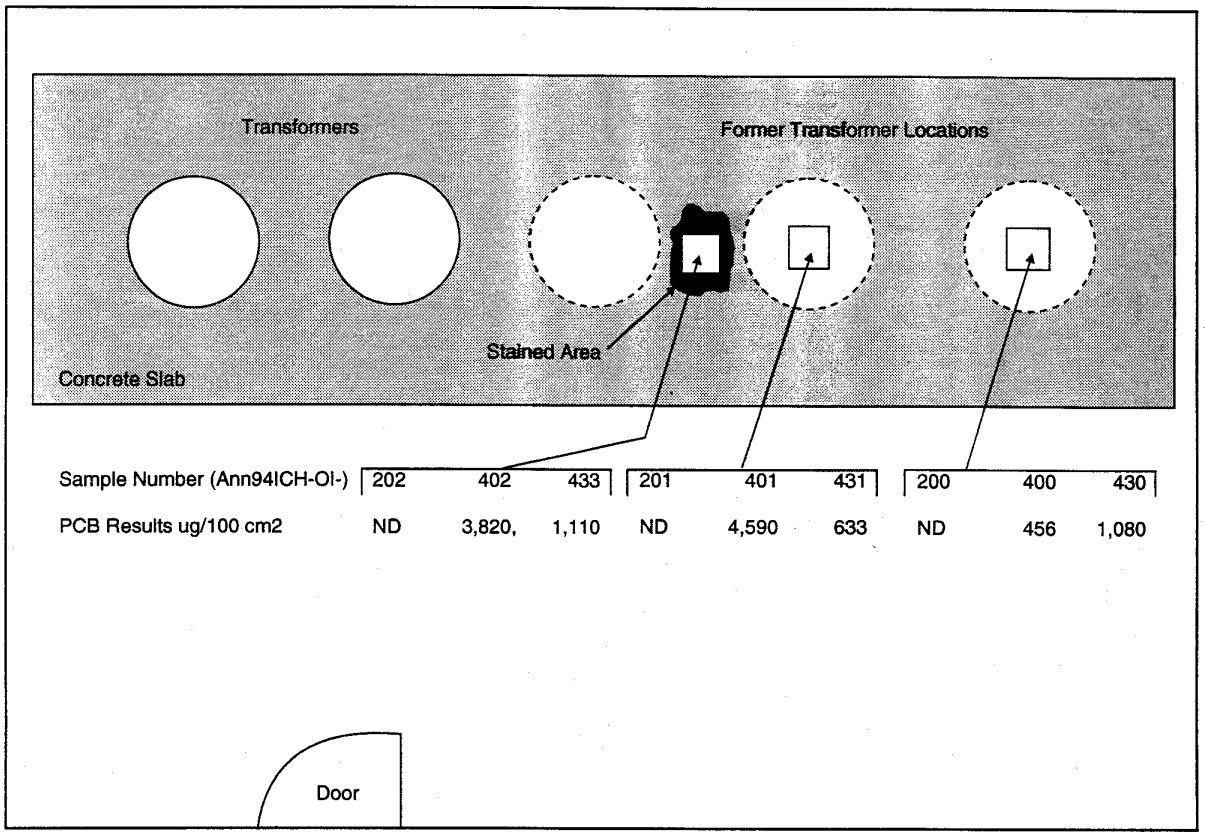
SOURCE: Field observation

N

| Ecology and Environment, Inc. | |
|---|---|
| Figure: 6-1 | Proj. No.: VS1000 |
| Date: 5-25-94 | Drawn By: JAL |
| Title: Annette Island FAA Station Hangar Facility Site Map | |

VS105962.CDR

Source: Ecology and Environment, Inc. 1994




| Sample Number (Ann94ICH-OI-) | 202 | 402 | 433 | 201 | 401 | 431 | 200 | 400 | 430 |
|---|---|---|---|---|---|---|---|---|---|
| PCB Results ug/100 cm2 | ND | 3,820, | 1,110 | ND | 4,590 | 633 | ND | 456 | 1,080 |

Sample Number ANN-94-ICH-OI-

| KEY |
|---|
| Note: Only Arochlor 1260 was detected. |
| Wipe Sample |
| ND Not Detected |

N

| Ecology and Environment, Inc. | |
|---|---|
| Figure: 6-2 | Proj. No.: VS1050 |
| Date: 10-18-94 | Drawn By: DEH |
| Title: Annette Island FAA Station IC Hangar Facility Wipe Sample Location and Results Map June 1994 | |

# 7. APPROACH LIGHTING SYSTEM (ALS) FACILITY

## 7.1 LOCATION AND DESCRIPTION

The ALS Facility is located north of the north end of the north-south runway (See Figure 1-2), on property formerly leased by FAA prior to 1973. An ECI conducted in August 1991 (E & E 1992b) identified the presence of 15 towers on the property. During the ESI. an additional structure, a Short Approach Lighting System Runway End Identification Lights (SALSR) was identified. The SALSR is a steel building mounted on skids and it contained a number of oil-filled electrical transformers and related electrical equipment. A diagram showing the location of the electrical equipment in the building is presented in Figure 7-1. It was determined by the FAA CO at the time of the IC investigation that oil samples should be collected from the electrical equipment, if possible, and submitted for PCB analysis.

## 7.2 INTERIM CLEANUP

### 7.2.1 Field Activities

Electrical equipment in the SALSR building was examined to determine if it contained oil. In a few instances, holes were drilled in small sealed units that could not be opened. A description of the electrical equipment found in the SALSR is summarized in Table 7-1. Of the oil containing units, all were sampled except for three sealed capacitors (approximately 5 gallons each) that could not be accessed. Nine oil samples were collected, and the samples were numbered ANN94ICS-OI-410 through ANN94ICS-418. A sample summary is presented in Table 7-2. The analytical results are presented in Table 7-3, and the locations of the samples are shown on Figure 7-1. PCB concentrations were less than 50 mg/kg in all samples except sample ANN94ICS-OI-417, which was collected from a large 100-gallon transformer located at the northwest corner of the building. Sample ANN94ICS-OI-417 contained 70 mg/kg of Aroclor-1260.

### 7.2.2 Deviations from the Work Plan

The ALS facility was not included in the ESI/IC work plan. As mentioned previously, the SALSR was first identified during the ESI/IC activity, and the decision to investigate it was made in the field.

### 7.2.3 Conclusions and Recommendations

The entire SALSR, including the oil-containing electrical equipment, is no longer in use and requires removal in accordance with FAA's good-housekeeping protocol. The 100-gallon transformer containing PCBs at a concentration of 70 mg/kg should be removed and disposed of according to EPA TSCA regulations. The three 5-gallon capacitors which were not sampled should be considered as PCB-containing and included with the PCB oil for removal.

## Table 7-1

**INTERIM CLEANUP**
**ELECTRICAL EQUIPMENT INVENTORY**
**ALS FACILITY**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**
**JUNE 1994**

| Component | Serial Number | Manufacturer | Gallons of Oil | Sample No. (ANN94-) | Dimensions |
|---|---|---|---|---|---|
| Transformer | 61AC5867 | Westinghouse | 8 | ICS-OI-410 | 2.5′ × 2.5′ × 8′ tall |
| Transformer | 12-1960 | Electric Specialty | 1 | ICS-OI-411 | 1′ × 1′ × 2.5′ tall |
| Transformer | 12-1960 | Electric Specialty | 1 | ICS-OI-412 | 1′ × 1′ × 2.5′ tall |
| Transformer | 60M5938 | Westinghouse | 8 | ICS-OI-413 | 3′ × 3′ × 3.5′ tall |
| Circuit breaker | 940017J | Westinghouse | 5 | ICS-OI-414 | 1.5′ × 1.5′ × 2.5′ tall |
| Transformer | None | Unknown | 100 | ICS-OI-415/418 (Dup) | 2′ × 3′ × 4′ tall |
| Transformer | None | Unknown | 100 | ICS-OI-416 | 2′ × 3′ × 4′ tall |
| Transformer | None | Unknown | 100 | ICS-OI-417 | 2′ × 3′ × 4′ tall |
| Capacitor | None | Unknown | 1 | Not sampled. | — |
| Capacitor | None | Unknown | 1 | Not sampled. | — |
| Capacitor | None | Unknown | 1 | Not sampled. | — |

Key:

PCB = Polychlorinated biphenyls.

**Table 7-2**

**INTERIM CLEANUP SAMPLE SUMMARY**
**ALS FACILITY**
**ANNETTE ISLAND FAA STATION**
**ANNETTE ISLAND, ALASKA**

| Sample No. (ANN94-) | Matrix | Analytical Parameters | Laboratory | Comments |
|---|---|---|---|---|
| ICS-OI-410 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-411 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-412 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-413 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-414 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-415 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-416 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-417 | Oil | PCB | ASC, Level III | Transformer oil |
| ICS-OI-418 | Oil | PCB | ABC, Level III | Duplicate of ICS-OI-415 |

Key

ASC = Analytical Services Center.
PCB = Polychlorinated biphenyls.

**Table 7-3**

**INTERIM CLEANUP OIL SAMPLES
POSITIVELY IDENTIFIED PCB COMPOUNDS - LEVEL III
ALS FACILITY
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA
(mg/kg)**

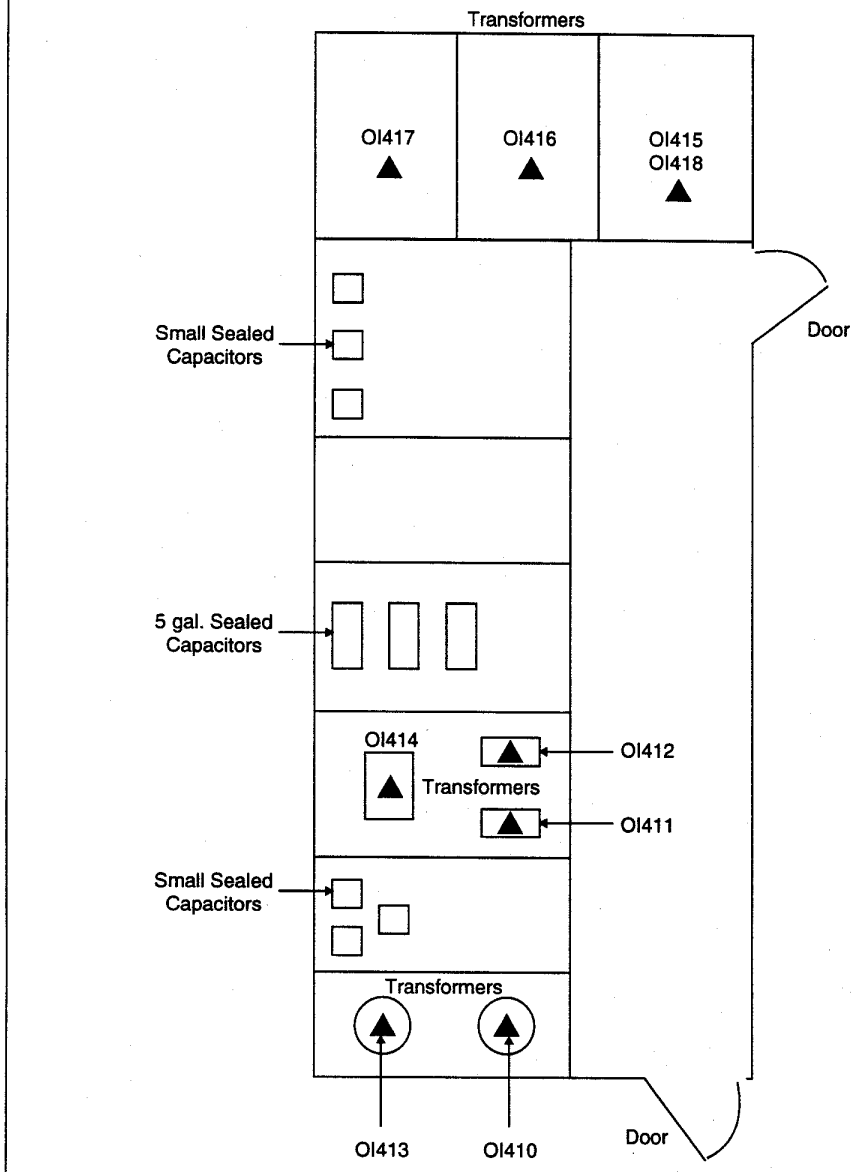
| Sample Number (ANN94-) | Type | PCB-1254 | PCB-1260 |
|---|---|---|---|
| ICS-OI-410 | 8 gallon transformer | ND(5.0) | ND(5.0) |
| ICS-OI-411 | 1 gallon transformer | ND(5.0) | ND(5.0) |
| ICS-OI-412 | 1 gallon transformer | 7.7 | ND(5.0) |
| ICS-OI-413 | 8 gallon transformer | ND(5.0) | 3.7 |
| ICS-OI-414 | 5 gallon circuit breaker | ND(5.0) | 13 |
| ICS-OI-415 | 100 gallon transformer | ND(5.0) | 25 |
| ICS-OI-416 | 100 gallon transformer | ND(5.0) | 26 |
| ICS-OI-417 | 50 gallon transformer | ND(10.0) | 70 |
| ICS-OI-418 | Duplicate of ICS-OI-415 | ND(5.0) | 27 |

Key:

ND = Not detected.

VS1050\VS105071.CDR

Source: Ecology and Environment, Inc. 1994




Not to Scale

| Ecology and Environment, Inc. | |
|---|---|
| Figure: 7-1 | Proj. No.: VS1000 |
| Date: 9-08-94 | Drawn By: JAL |
| Title: ALS Facility Transformer Oil Sample Location Map | |

Sample number ANN-94-ICS-
SOURCE: Field observation

**KEY:**
▲ Oil sample and number.

N

# 8. GLIDE SLOPE TRANSMITTER (GS) FACILITY

## 8.1 LOCATION AND DESCRIPTION

The GS facility is located on formerly leased property on the east side of the north-south runway near the north end (see Figure 1-2). The facility consists of Building 405 and associated electrical equipment. FAA's lease ended in 1973 and the facility is inactive. An ECI conducted in August 1991 (E & E 1992b) identified the presence of an abandoned transformer in a transclosure next to building 405. The oil in the transformer was tested during the ECI and found to contain less than 50 mg/kg PCB. Consequently, it was not removed during the removal action in 1992 (E & E 1993a). During the ESI, however, the transformer was inspected and found to be in disrepair, and the decision was made by the FAA CO that the oil should be removed and disposed of to prevent future spillage.

## 8.2 INTERIM CLEANUP ACTIVITIES

### 8.2.1 Field Activities

Approximately 15 gallons of non-PCB oil were pumped from the abandoned transformer into a 55-gallon drum. Sorbent pads were then used to clean the transformer of the remaining oil. The sorbent material and all pumping equipment were then triple-bagged for disposal. The drummed oil and all waste material were manifested and shipped by the subcontractor in compliance with applicable EPA regulations. The material was transported from Annette Island by licensed chartered aircraft to Anchorage and transferred to an approved RCRA disposal facility. The shipment manifest was provided to FAA and the mandatory EPA PCB importation letter will be forwarded to EPA as prescribed in the regulations. A copy of the shipping manifest is presented in Appendix E, Volume 2.

### 8.2.2 Deviations From the Work Plan

The GS facility was not included in the ESI/IC work plan. As mentioned previously, the transformer was found in disrepair, and the decision to remove the non-PCB oil from it was made during the ESI/IC activity.

### 8.2.3 Conclusions and Recommendations

. The empty transformer should be disposed of as part of FAA's good housekeeping practice.

# 9. LOCALIZER (LOC) FACILITY

## 9.1 LOCATION AND DESCRIPTION

The LOC facility is located southwest of the south end of the north-south runway on property formerly leased by FAA (see Figure 1-2). All that remains at this facility is an abandoned building in disrepair.

## 9.2 INTERIM CLEANUP ACTIVITIES

### 9.2.1 Field Activities

During the ESI, five small, sealed (less than 1 gallon) transformers, which appeared to contain oil, were discovered lying on the ground next to the building. At the direction of the FAA CO, the transformers were collected and placed in a 30-gallon drum for storage in the hazardous materials storage building located at the VORTAC/DF facility.

### 9.2.2 Deviations From the Work Plan

The LOC facility was not included in the ESI/IC work plan. Authorization for work performed at this facility was made by the FAA CO during the ESI/IC activity.

### 9.2.3 Conclusions and Recommendations

No further action is required at the LOC facility.

# 10. STATION RECOMMENDATION SUMMARY

This section presents recommendations for the entire Annette Island FAA Station and reflects the information and conclusions discussed in the facility-specific conclusions and recommendations sections. A concise summary of the recommendations is provided in Table 10-1. Facilities investigated are described in detail in Sections 3 through 9.

## 10.1 VORTAC/DF FACILITY

### 10.1.1 Expanded Site Investigation

Based on sample results, further action is recommended to address lead contamination that exceeded MSEC and TCLP criteria in source samples. Approximately 300 cubic yards of soil are potentially affected.

## 10.2 NDB/H-MARKER FACILITY

### 10.2.1 Expanded Site Investigation

Based on sample results, further action is recommended to address lead contamination that exceeded MSEC and TCLP criteria in source samples. Approximately 150 cubic yards of soil are potentially affected. Since access to this facility is not restricted, steps should be taken to contain the contaminated soil and control access to it.

## 10.3 RCAG FACILITY

### 10.3.1 Expanded Site Investigation

No CERCLA-regulated contaminants exceeded MSEC or TCLP regulatory criteria at the RCAG facility. No further action is recommended for this facility.

### 10.3.2 Interim Cleanup

Further action is required to decommission the empty UST according to ADEC regulations.

## 10.4 HANGAR FACILITY

### 10.4.1 Interim Cleanup

Additional cleaning or removal of the Hangar floor is required to remediate the area according to TSCA regulations.

## 10.5 ALS FACILITY

### 10.5.1 Interim Cleanup

Further action is required to remove an inactive PCB-containing transformer according to TSCA regulations. In additional, action is required to remove non-PCB containing inactive electrical equipment according to FAA's good housekeeping practices.

## 10.6 GS FACILITY

### 10.6.1 Interim Cleanup

Further action is required to dispose of an empty transformer according to FAA good housekeeping practices.

## 10.7 LOC FACILITY

### 10.7.1 Interim Cleanup

No further action at the LOC facility is required.

## 10.8 ADDITIONAL RECOMMENDATIONS

There are no additional recommendations regarding the Annette Island FAA Station.

**Table 10-1**

**STATION RECOMMENDATIONS
ANNETTE ISLAND FAA STATION
ANNETTE ISLAND, ALASKA**

| Facility | ESI | IC |
|---|---|---|
| VORTAC/DF | Address lead contamination on gravel pad. | An IC was not conducted at this facility. |
| NDB/H-Marker | Address lead contamination in soil next to old building foundation. Contain and control contaminated soil. | An IC was not conducted at this facility. |
| RCAG | No further investigation is recommended. | Decommission UST per ADEC regulations. |
| Hangar | An ESI was not conducted at this facility. No conditions requiring investigation were observed during IC field operations. | Reclean or remove PCB-contaminated floor. |
| ALS | An ESI was not conducted at this facility. No conditions requiring investigation were observed during IC field operations. | Remove PCB and non-PCB containing electrical equipment. |
| GS | An ESI was not conducted at this facility. No conditions requiring investigation were observed during IC field operations. | Remove non-PCB containing transformer. |
| LOC | An ESI was not conducted at this facility. No conditions requiring investigation were observed during IC field operations. | No further action is recommended at this facility. |

Key:

ALS = Airport lighting system.
ESI = Expanded Site Investigation.
FAA = Federal Aviation Administration, Alaskan Region,
GS = Glide slope.
IC = Interim Cleanup.
LOC = Localizer.
NDB = Nondirectional beacon.
VORTAC/DF = Very high frequency omnidirectional range tactical air/ground communications/directional finder.

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